HEATING AND VENTILATING

JANUARY 1930

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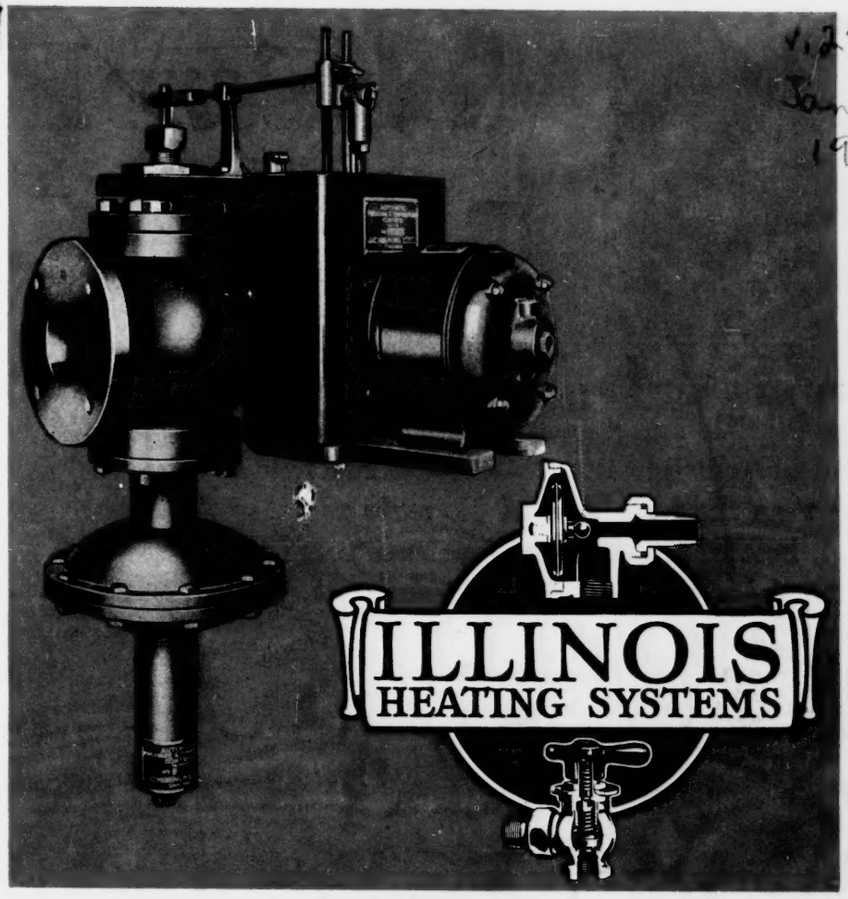


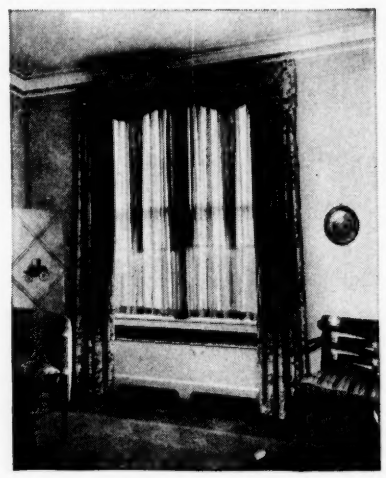
ILLINOIS THERMO-MANUAL ZONE CONTROL AS A COMPONENT PART OF AN ILLINOIS HEATING SYSTEM AFFORDS THE UTMOST IN HEATING COMFORT AUTOMATIC OPERATION AND FUEL ECONOMY.

ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD. PRES. INCORPORATED 1900
BRANCHES AND REPRESENTATIVES IN 40 CITIES
CHICAGO

Modern Homes simply *must* have these Modern Radiators

Tucked under windows, or concealed in the walls, these modern radiators add, rather than detract from the charm of rooms. For only the inconspicuous grille and a small air inlet near the floor can be seen. Beauty instead of "Unsightliness"—"Unobtrusiveness" rather than the bulkiness of old-style radiators.

And, best of all, these modern radiators warm rooms *quicker and more completely.*

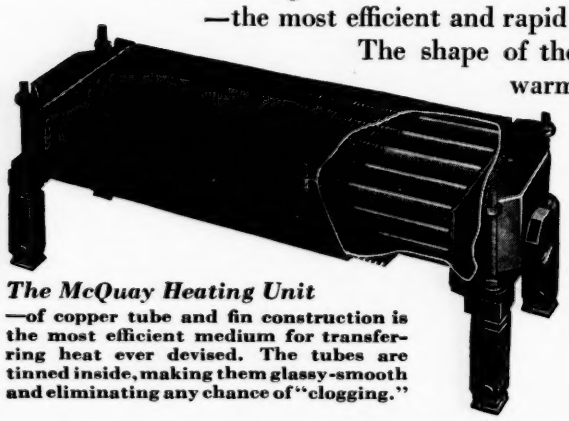


McQUAY *Modern* RADIATORS

The heating unit, housed in the steel cabinet, is of indestructible copper tube and fin construction —the most efficient and rapid means of transferring heat ever devised.

The shape of the cabinet, and a deflector above the heating unit, directs the warmed air into rooms parallel to the floor, circulating it throughout. **Rooms are heated far quicker, and more completely.**

The illustrations picture the *completely concealed* type of McQuay Radiators. For those who want modern heating, at even less cost, McQuay Cabinet Radiators may be had **at a cost that is usually less than for old-style radiators with separate covers or shields.**



The McQuay Heating Unit

—of copper tube and fin construction is the most efficient medium for transferring heat ever devised. The tubes are tinned inside, making them glassy-smooth and eliminating any chance of "clogging."

McQuay Radiators are made in Cabinet and Completely Concealed types, in sizes and capacities for every need. Ask for complete data.

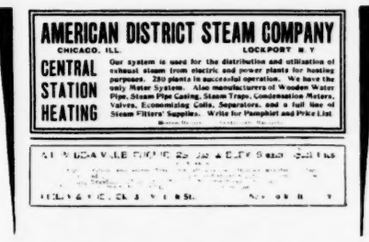
McQUAY RADIATOR CORPORATION

General Offices, 35 East Wacker Drive, Chicago

Branches in most principal cities

V.27, pt.1

Be Guided by the Test of Time



The first issues of Heating and Ventilating Magazine—twenty-five years ago—carried ADSCO advertising on its front cover.

in the selection of your Steam Line Equipment

ADSCO Model P Variator for pressures up to 125 pounds. Takes up expansion and contraction. A packless expansion joint never requiring any attention whatever.

ADSCO Nelson Gate Valve for 400 pounds working steam pressure. Completely mounted with non-corrosive metal. Designed for continuous, dependable service. Other valves for lower pressures.

ADSCO Perfection Reducing Valves reduce initial steam pressure of 20 lbs. or less to low delivery pressures.

THERE are two ways to determine how well a product is equipped to serve you. Try it out yourself, or look into the records of its past performance. . .

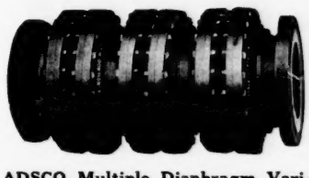
ADSCO Steam Line specialties invite this investigation. The broader your inquiry, the more positive the evidence that they will serve you well.

With the exception of the Multiple Diaphragm Variator, which is new, every product on this page has been time-proved on thousands of steam line installations. And the Multiple Diaphragm Variator is merely an adaptation of the famous ADSCO Variator, which has given exemplary performance on the country's greatest steam line installations—less than 1/10 of 1% ever having required attention in 10 to 30 years of service.

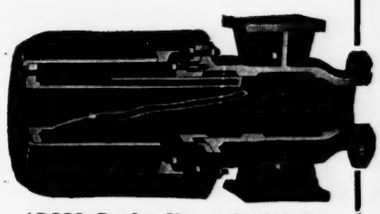
The wide preference of leading engineers for ADSCO products is indicative of the quality of ADSCO performance. The use of ADSCO specialties on your steam lines means installation and maintenance economy .... and extra years of carefree service.

Write for complete information

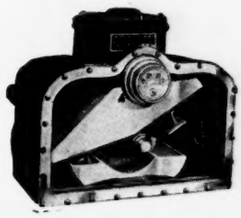
AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.
50 Years in Business



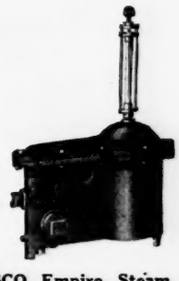
ADSCO Multiple Diaphragm Variator, made with iron body, for pressures up to 250 pounds and temperatures to 400° F. With steel body for pressures to 400 pounds and temperatures to 750° F.



ADSCO Duplex-Sleeve Guided Expansion Joint for pressures up to 400 lbs., and any temperature up to 750° F. Air-cooled slip eliminates packing trouble, and insures years of trouble-free service.



ADSCO Simplex Condensation Meter for metering steam condensation. For departmental metering in manufacturing plants, and for accurate metering in District Heating Service. Economical, dependable, efficient.

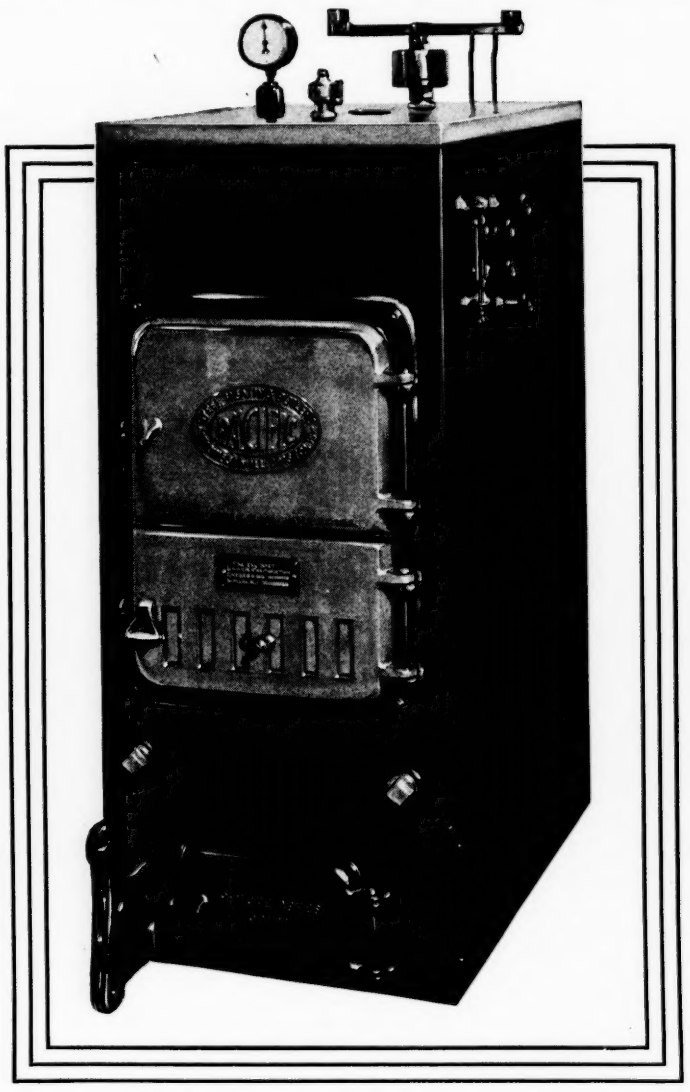


ADSCO Empire Steam Trap for low pressure. Operating range, vacuum to 20 pounds pressure. Extremely simple and dependable, insuring continuous, carefree service.

278126

HEATING AND VENTILATING, *formerly* THE HEATING AND VENTILATING MAGAZINE, published by NATIONAL BUILDING PUBLICATIONS, Division of NATIONAL TRADE JOURNALS, INC., at 521 Fifth Ave., New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single Copies, 30 cents. Vol. XXVII, No. 1, January, 1930. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879. Copyright, 1930, by NATIONAL TRADE JOURNALS, INC.

PACIFIC



Presenting the Pacific Steel Boiler JACKETED

The new all steel, welded, rock-wool insulated residence boiler at an unusual price

NEW; distinctive; important to every contractor, realtor, and architect; the Pacific Jacketed Steel Boiler is announced.

All steel, it eliminates repair bills, lessens building delays, and makes satisfied owners. Welded seams make caulking needless and leakage impossible. Proved heating principles cut coal bills to the minimum.

Added to these tried Pacific advantages is the handsome new jacket of heavy gauge steel, finished in mirror-smooth baked-on blue enamel, with a resplendent red top and vitreous enamel red doors. Between boiler and jacket, a thick blanket of rock-wool insulation, steel wire reinforced, has no equal for effectiveness.

Without a peer in its field, the Pacific Jacketed Steel Boiler costs little if any more than boilers at all comparable. Complete information will prove a valuable aid in your heating selections. Write for it.

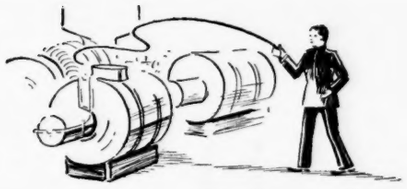
STEEL HEATING BOILERS · PACIFIC · WAUKEGAN ILLINOIS · TRADE MARK REG. U.S. PAT. OFF.

PACIFIC STEEL BOILER CORPORATION

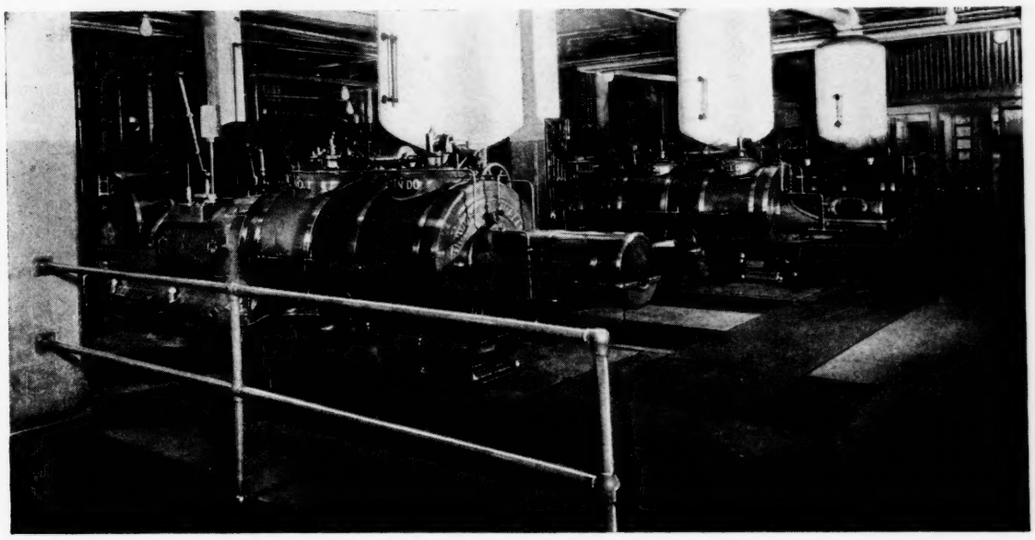
Factories: Waukegan, Ill., Bristol, Pa.

Sales Offices in 58 Cities

Division of United States Radiator Corporation, Detroit

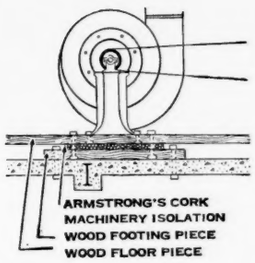


Even Heavy Hotel Engines *can be quieted....*



There are 1823 *sq. ft. of Armstrong's Cork Machinery Isolation in the foundation pits of these three Skinner engines; weight of slab and equipment about* 1200 *lbs. per sq. ft.*

when vibration and noise are subdued by cork....



HEAVY operating machines too often can be heard all over the building. But they can be quieted—as they have been in the Hotel Peabody, of Memphis, Tennessee.

In this modern hostelry three Skinner steam engines generate power. But they go about their work quietly, without transmitting vibration or noise throughout the structure. For, the foundation pits under the machines are lined with Armstrong's Cork Machinery Isolation to absorb vibration and noise, a 2-inch layer, 1.1 pound density, on the sides of the pits, and a 2-inch layer, 1.5 pound density, on the bottoms.

Practically all machinery can be cushioned in this effective manner. For Armstrong's Cork Machinery Isolation is made in three densities and seven thicknesses to provide for all operating conditions and weights.

Isolation saves undue wear and tear on the cork-cushioned machine and promotes smooth-running efficiency. It protects the building structure from vibration. It keeps hotel and apartment rooms, and offices, quiet and free from annoying jar and hum.

Armstrong's Cork Machinery Isolation is permanently effective. Since cork takes no "set" even under sustained compression, it keeps its resiliency after years of service. It does not deteriorate or disintegrate. And the cost is remarkably reasonable.

We will be pleased to tell you how best to deaden vibration and noise in any operating machinery. The services of our engineers are at your disposal. Armstrong Cork & Insulation Company, 925 Concord Street, Lancaster, Pa.

The best results!

Armstrong's Cork Isolation is installed for: air compressors, blowers, drill presses, drop hammers, elevator hoists, engines, fans, forging machines, machine tools, motors, printing presses, pumps, punching machines, refrigerating machines, vacuum cleaners, and similar apparatus.

Armstrong's Cork Machinery Isolation

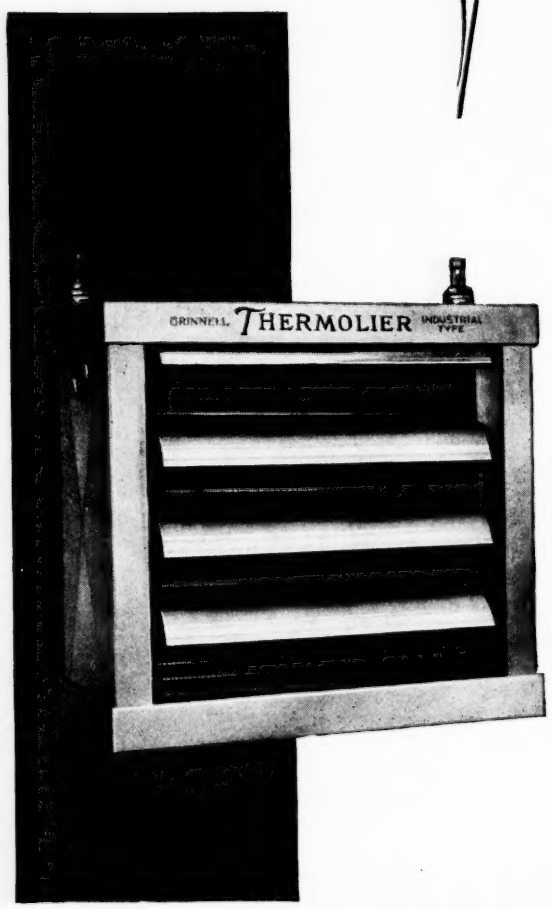
Wins *Preference*

NEARLY 10,000 Grinnell Thermoliers have been installed in a great variety of occupancies.

Single units have been used to correct bad heating conditions in isolated sections of plants,—shipping platforms and the like. Sections of obsolete heating equipments have been thoroughly modernized by the use of only a few units.

Whole plants using from 50 to more than 200 units are being successfully heated.

Under these varying conditions it is remarkable that no serious complaints have been received of their failure to do what they were intended to do. Partly this enviable record of Thermolier is due to the fourteen points of superiority which long Grinnell experience built into the unit itself.



Made in eight models to fit any space and every condition.

GRINNELL

Executive Office: Providence, R. I.

by Performance

Partly it is due to the close engineering cooperation which we have given to engineers, architects and contractors to the end that our practical field experience be fully utilized in selecting the right number and type of unit for each particular job.

Finally this splendid performance record is attributable to a definite Grinnell policy which prevents salesmen from forcing sales where the intended use, either due to layouts or unfavorable conditions, was questionable. Such a policy is firmly based on a real intent to assure users of performance that warrants a preference.

You may care to study the Fourteen Points of Thermolier Superiority. Booklet detailing these points gladly sent on request. Send the coupon today.

"I've checked them all for performance and for real economy Grinnell Thermoliers win my preference."

14 Points of Superiority

GRINNELL COMPANY, INC.
208 W. Exchange St., Providence, R. I.

I want to read more facts about the Thermolier. Send along the booklet.

Name .....

Title .....

Firm Name .....

Address .....

COMPANY

Branches in all Principal Cities

A NEW KEWANEE STEEL BOILER

for Homes and Smaller Buildings

BORN of more than 60 years experience in boiler building, here is a boiler especially designed, engineered and built to meet the demand for a *better residence heating boiler.*

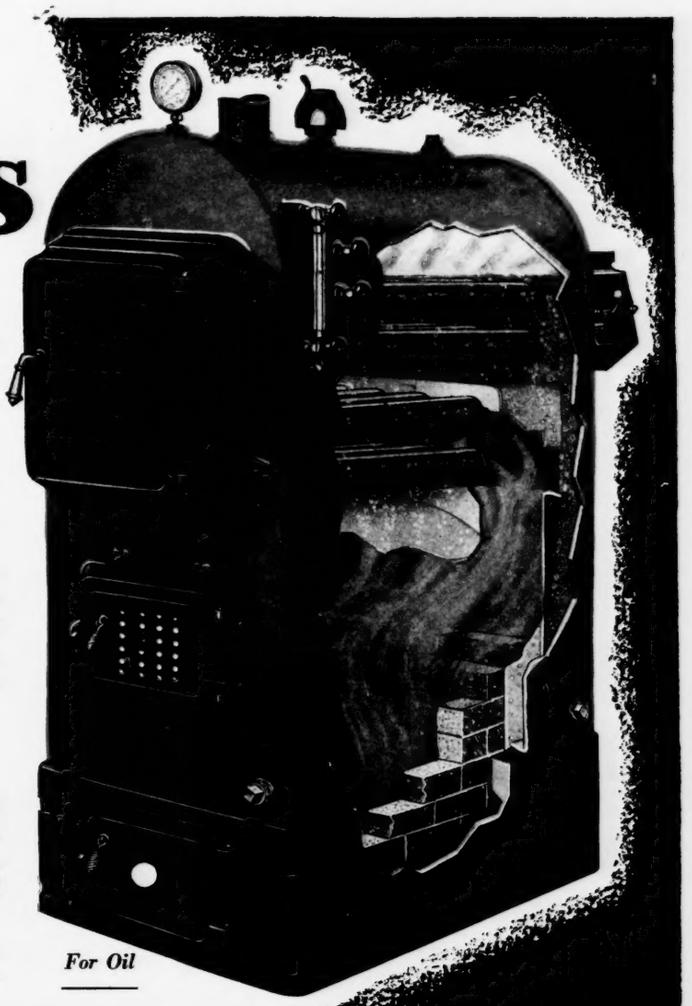
Actually—it is a climax in the development of steel boilers—a product well worthy to take its place in the Kewanee line—the most complete in the world.

In Type "R" will be found all that correctness of design; sturdiness of materials; and skilled care in manufacturing which has kept Kewanee foremost among steel heating boilers.

Even to the smallest details it is built UP to the rigid Kewanee requirements—a **boiler that can be relied upon to give many extra years of service**—not a boiler built DOWN to a price.

NOW—there's a Kewanee Steel Boiler

for COAL, OIL *or* GAS



For Oil

Features of Design

A *bigger, higher combustion chamber* provides plenty of space for the fuel gases to mix with air and burn completely. Fewer firings are needed because the firebox permits carrying a larger bed of coal.

The "*right-side-up*" *crown sheet*—a distinctive Kewanee feature—is self-cleaning and self-draining. Sediment and scale cannot collect above the hottest fire zone. This construction also adds strength.

The Double-Pass gives longer travel of gases as they are given a "Forward Pass," then a "Backward Pass"—*twice the length of the boiler*—before reaching the stack. All of the useful heat is thus absorbed by the water in the boiler.

A *more generous steam space* provides ample storage capacity, and prevents "priming."

Features of Construction

Thicker, *heavier steel plate*, with all flat surfaces stiffened with threaded and riveted-down staybolts, gives Type R a strength which insures **many extra years of service.**

Castings are heavier—the smaller pieces being of tough malleable iron.

All *doors are surface ground and fitted* tight to frame. Doors exposed to heat are protected with high temperature insulating material, preventing escape of valuable heat.

The base, of very heavy cast iron, goes into the basement *in one piece*, completely assembled.

Grates operate on trunnions fitted into removable sockets which rest in the base.

The damper and balanced draft doors are *back of the boiler*, and instead of being operated by chains dangling in front, are both operated by a single rod.

Conservative Ratings

Catalog Ratings are in conformity with the Steel Heating Boiler Institute's Code for low pressure heating boilers.

They will carry the total radiation load listed as their capacity and in addition will *easily handle large overloads*, with long firing periods and with low stack temperatures.

Extremely Efficient

In tests—made as nearly as possible under actual working conditions—efficiencies ran far better than the average for low pressure heating boilers.

For Coal, Oil or Gas

Specially designed and built for burning various kinds of fuel—hard or soft coal, oil or gas—there is a Type "R" for every locality.

In sizes to heat from 370 to 1960 square feet of steam, and from 590 to 3140 square feet of water radiation. Details in Catalog No. 88.

CAST-IRON BASE,
GOES INTO BASEMENT ALL READY ASSEMBLED

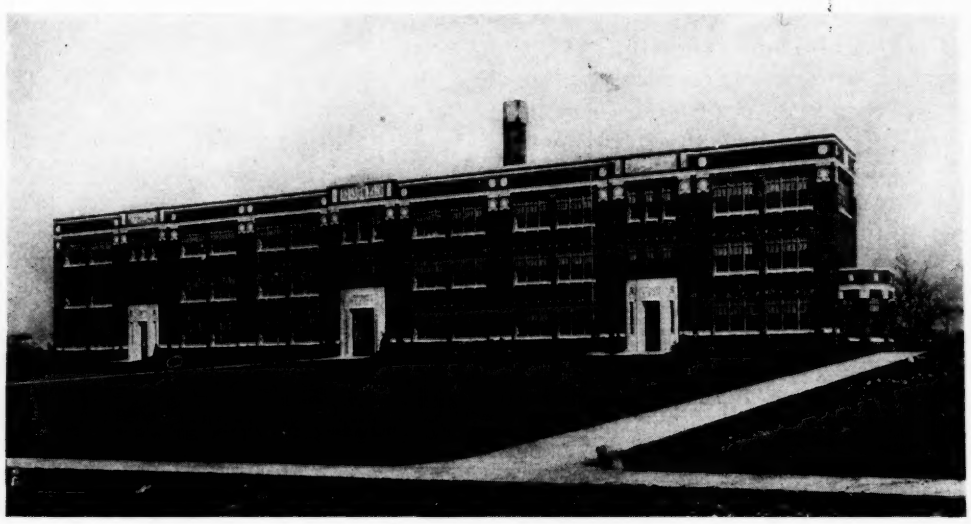
KEWANEE BOILER CORPORATION
division of American Radiator and Standard Sanitary Corporation
Kewanee, Illinois
Branches in 40 Principal Cities

to heat every size and type of building

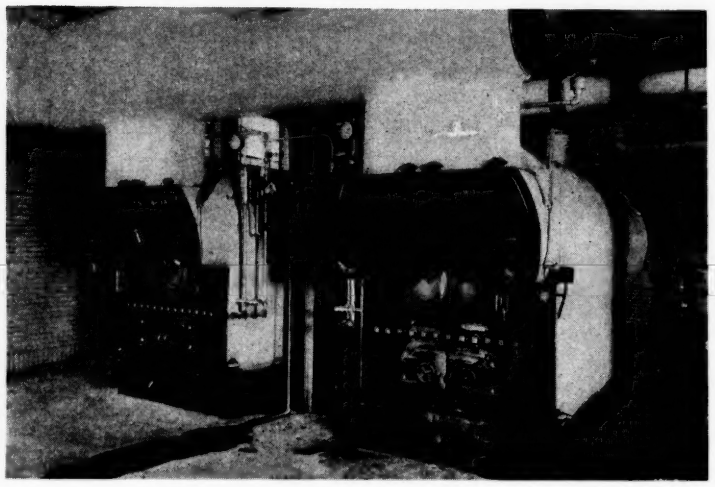
GROWING LEADERSHIP

THE New Ferdinand Schumacher School, Akron, Ohio, is another Link in the Splendid Chain of Educational Buildings being heated by Coatesville Welded Steel Fire Box Boilers.

Incorporated in this Magnificent Structure are Numerous Details, Innovations in School Construction and Design. We regard it as a Tribute to our Progress, that Coatesville Boilers were chosen.



Ferdinand Schumacher School, Akron, Ohio

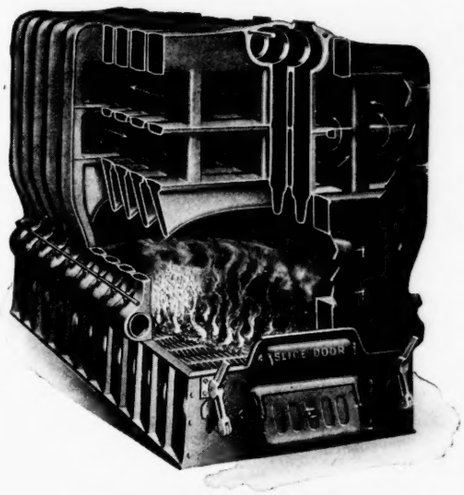


Architect:
M. M. Konarski
Akron, Ohio

Heating Contractors:
Zindle Plumbing & Heating Co.
Akron, Ohio

COATESVILLE BOILER WORKS

Main Office and Works—COATESVILLE, PA.



Monarch Boiler (Cutaway)

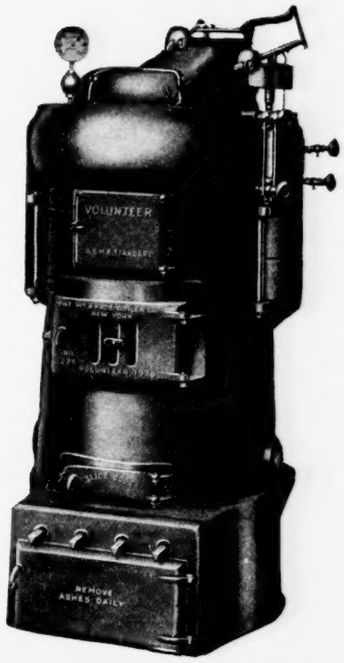
MORE of EVERYTHING but FUEL

MORE grate area—more heating surface—more boiler—more heat—but lower fuel cost.

These features make Page Boilers superior in the field for coal or oil burning. Simplicity of design and ease of operation only serve to make them the more desirable of boilers.

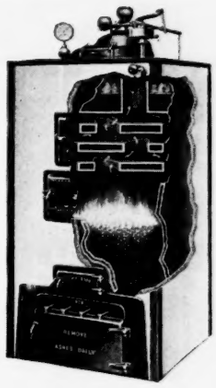
Now is the time to change to Page—and insure your client's comfort.

Send for Our Catalogue No. 55



Volunteer Steam Boiler

Red Diamond Boiler



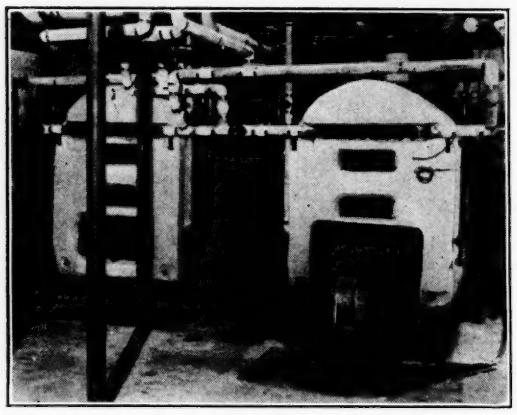
Red Diamond (Cutaway)

The Wm H Page Boiler Co

Branch Offices and Warehouses:
Boston, 123 Beverly Street
Philadelphia, 1126 Washington Ave.
Cleveland, 5 Villa Beach, Lake Shore Blvd.
Factory: Meadville, Pa.

200 Madison Avenue, New York

"Now is the time to change to Page"



Two Triple-Service Boilers were installed—only one is necessary to heat this spacious country home.

GEORGE G. MILNE
52 VANDERBILT AVENUE
NEW YORK, N.Y

December 12, 1929.

Thermo-Service, Inc.,
101 Park Ave.,
New York, N. Y.

Gentlemen:

In reply to your recent inquiry as to the results I am obtaining with your Triple-Service boilers, I am glad to advise that these have given the best of satisfaction in all respects.

As you know, my house is large, having 5500 feet of radiation; and being located on a knoll with no surrounding protection, I felt it would be good insurance to install two of your Triple-Service boilers, each rated at 3500. These boilers are fired by "Petro" oil burners, and it would interest you to hear that it has never been necessary to run both boilers simultaneously for one boiler heats the entire building without any overload. Also, summer and winter, we have had plenty of real hot water and altogether the outfit has been most satisfactory.

I can say the same of the Triple-Service boiler we installed in the farm group, which takes care of two cottages, garage and greenhouse.

Very truly yours,
G. G. Milne

Here is another case of typical Triple-Service performance. This beautiful mansion, located in Purchase, N. Y., Westchester County, one of the most exclusive residential communities in the country, is a masterpiece of design, construction and comfort. Its owner had no thoughts of practicing economy in this home when the architects made up the plans, and to guard against severest winter weather two Triple-Service boilers were installed. Yet, as Mr. Milne writes, it has never been necessary to run both boilers simultaneously. One Triple-Service is more than doing the job without overload, despite the fact that the house has 5500 feet radiation and each Triple-Service is rated for only 3500 feet.

Whether you are building a large house, a mansion, an apartment house or an office building, you should get Triple-Service facts before you buy a boiler.

Don't forget to visit our booth, No. 453, at the Heating and Ventilating Exposition at Philadelphia, from January 27th to 31st.

INTERNATIONAL BOILER WORKS CO., East Stroudsburg, Pa.

Distributors

THERMO SERVICE, Inc.
New York City, N. Y.
OIL BURNER CORP.
Trenton, N. J.
CHAS. T. KING & CO.
Baltimore, Md.

WARNER PLUMBING & HEATER CO.
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Specify

WALWORTH
VALVES
FITTINGS
AND TOOLS

WALWORTH MAKES
BRONZE VALVES
FOR EVERY PRACTICAL PRESSURE

● Walworth manufactures a full line of bronze valves covering all requirements up to the highest pressures for which bronze can safely be used. These include both solid wedge and double disc gate valves and a complete line of globe, angle and check valves with the various accepted types of seats and discs. ● One of the popular valves used where a heavier than standard valve is desired is the Walworth Fig. 225M for 150 lbs. W. S. P. illustrated here. ● It is of especially sturdy construction, with gland in stuffing box, non-heating malleable hand wheel and can be repacked under pressure when the valve is wide open.

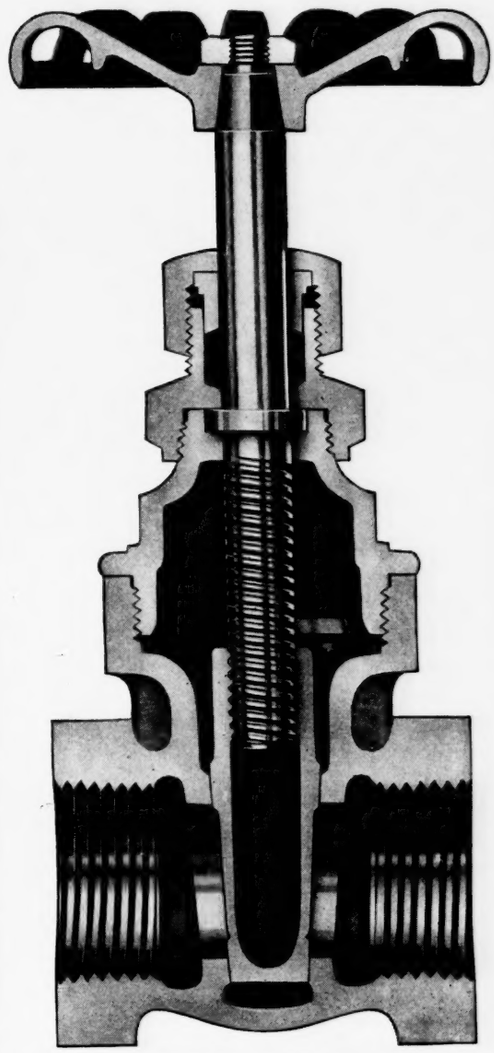


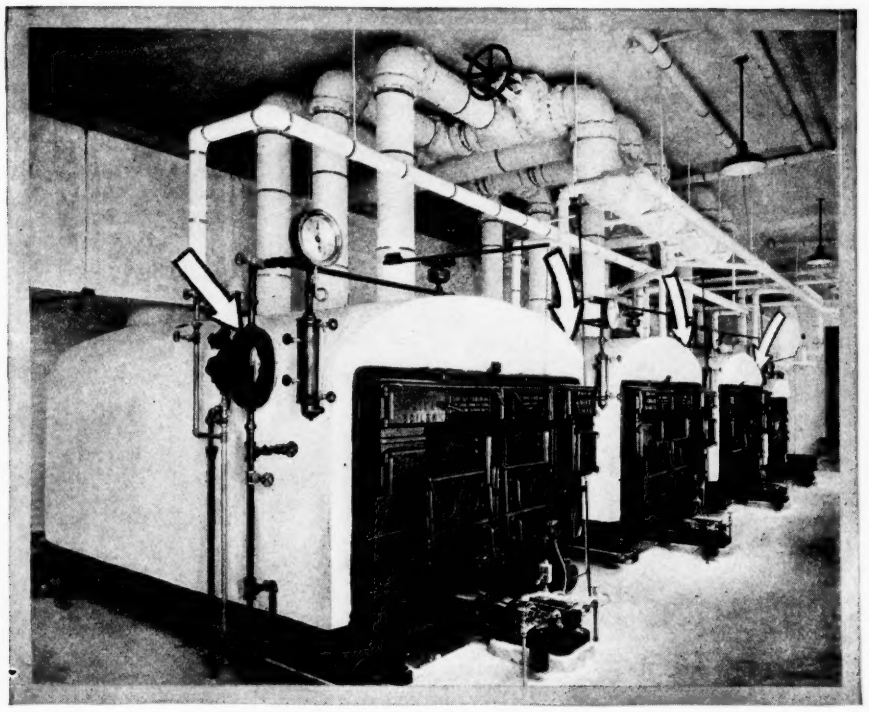
FIG. 225M SECTIONAL

for

PLUMBING
AND
HEATING

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa.; and Attalla, Ala.
Walworth Company Limited, 620 Cathcart St., Montreal, P. Q.
Walworth International Co., 11 Broadway, New York, Foreign Representative
. . . Distributors in Principal Cities of the World . . .



Bassick High School, Bridgeport, Conn., four H. B. Smith No. 60 Boilers protected by four McDonnell & Miller No. 28 Feeders installed by W. P. Kirk Co., Bridgeport, Conn.

Memory's Successor

There is no way out after the boiler water level is forgotten and the damage is done. But there's a way *around* before it happens—the McDonnell & Miller way. Why not entrust the vital job, of keeping the boiler water line where it belongs, to this dependable device whose memory cannot fail?

There is now a McDonnell & Miller Boiler Feeder for every type and size of steam, vapor or vacuum boiler—the time-tested No. 28 Self-Cleaning Duplex Feeder for medium and large boilers—the No. 29 Feeder for process boilers—and that new addition to the McDonnell & Miller line, the McDonnell No. 30 Safety Feeder, designed particularly for smaller jobs where price is a factor.

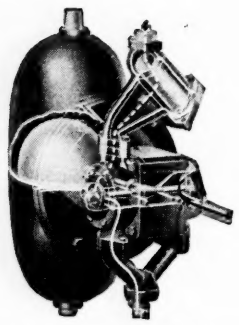
Particularly for the oil-fired job, a dependable boiler feeder is nothing short of a necessity, and with the McDonnell & Miller line now broadened to cover every requirement of every type of low pressure boiler, there is no longer any excuse for *any* installation being unprotected.

A new bulletin covers the triumvirate of McDonnell & Miller Feeders. Use the coupon to request your copy.

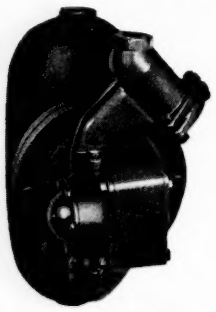
McDONNELL & MILLER
1314 WRIGLEY BUILDING CHICAGO
Eastern Office: Grand Central Terminal, New York, N.Y.

McDONNELL & MILLER
1314 WRIGLEY BLDG., CHICAGO
Please send bulletin covering the full line of McDonnell & Miller Boiler Feeders.

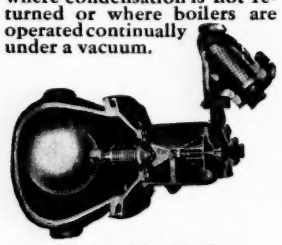
Business Name_____
Individual_____
Street and No._____
City and State_____ HV-1



for Medium & Large Boilers
The McDonnell & Miller
No. 28
Self-Cleaning Duplex Feeder. The Feeder that set the standard of duplex feeder quality.



for Process Boilers
The McDonnell & Miller
No. 29 Single Valve Feeder
The ideal feeder for all boilers where condensation is not returned or where boilers are operated continually under a vacuum.



for Smaller Boilers
The McDonnell & Miller
No. 30 Safety Feeder
This newest addition to the McDonnell & Miller line answers the demand for a quality feeder at a price low enough to justify its installation on small boilers. As a result, it more than doubles the field for feeder installations. Unlike low water cut-offs, which simply stop the oil burner or gas burner, the No. 30 Safety Feeder restores the boiler water line to a safe level without shutting down the heating system. Every small oil or gas-fired job should have a McDonnell Safety Feeder.

Be sure to see our exhibit at Booth 706, International Heating and Ventilating Exposition, Philadelphia, Jan. 27 to 31, inclusive

McDONNELL & MILLER
Boiler Feeders

"Doing one thing well"

Burnham Boilers

IN BRASS
for Hot Water Supply

It Takes Brass To Use Brass for One Thing and Not The Other

The Burnham Catalogue gives particulars of Burnham Boilers for every heating purpose.

Be honest now. What's the use of putting in brass pipe and then use a cast iron water supply boiler? If it's an absolutely stainless job you want, how can you have the brass to use brass for one and not for the other?

Burnhams, with all brass fire pots, are of exactly the same design as are those in iron. They give the same fuel thrifty service, with the added advantage that they complete an all brass hot water system at its most important point.

Write for catalogue giving full descriptions, ratings and measurements.

Burnham Junior takes care of the hot water supply for a large house. Its tank capacity runs up to 700 gallons. In brass it is in demand for all installations where a large supply of pure hot water is imperative.

Burnham Laundry Stove is a double duty boiler. Its top opens up to full washboiler size. It can be automatically regulated.

Burnham Boiler Corporation

IRVINGTON, N. Y.

Representatives in all Principal Cities of the United States and Canada

In the new Worcester Exchange...

the air will be appreciated by operators ... and apparatus, too

The condition of the air is especially important in a telephone exchange. Dust must be kept out. Apparatus must be kept clean if it's to be kept working ... particularly where there are automatic exchanges. And operators appreciate good air, too!

In the Worcester Exchange now being built for the New England Telephone and Telegraph, there are 85 Sturtevant Unit Heater Ventilators censoring the condition of the air. These units draw in air from out-of-doors—*filter it clean of all dust and impurities*—warm it to desired temperature and then pass it into the room noiselessly, safely—without a sign of draft.

Sturtevant Unit Heater Ventilators are compact...good-looking (in an unobtrusive way)...and SILENT. They fit into buildings, old or new, without expensive duct work. Typical installations are shown in Catalog 361. A copy? For the asking—from our nearest office.

B. F. STURTEVANT COMPANY

Plants and Offices at: Berkeley, Cal. ◦ Camden, N. J. ◦ Framingham, Mass. Galt, Ontario ◦ Hyde Park, Mass. ◦ Sturtevant, Wis.

Branch Offices at: Atlanta; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C. ◦ *Canadian Offices at:* Toronto; Montreal and Galt. ◦ *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg.

Also Agents in Principal Foreign Countries

Sturtevant Reg. U. S. Pat. Off. *the Silent* **Unit Heater-Ventilator**

SUPPLIES OUTDOOR AIR FILTERED CLEAN AND TEMPERED

Greener pastures

A GOOD way to pull the wool over a dealer's eyes is to quote him the old one about the cow that thought the grass was greener in the other pasture, but was fooled when she got over there. That's supposed to make him contented with his own pasture.

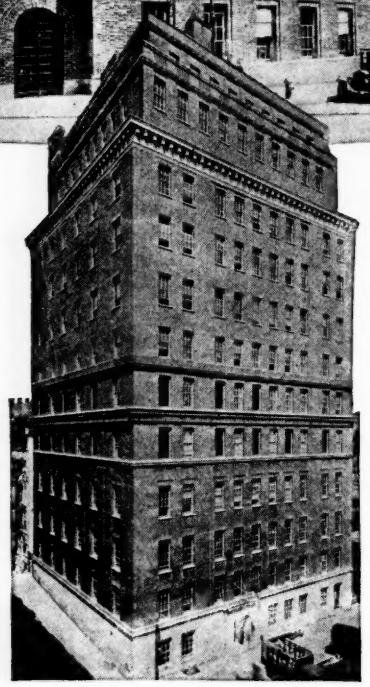
But just give us a chance to show you how green the greenbacks are in the Hardinge pasture and then you'll understand why the turnover among Hardinge Dealers is practically nil—*we're satisfied and making money.*

Investigate! It may prove to be the biggest and best business move you ever made! Call up or drop a line of inquiry to Hardinge Brothers, Inc., 4149 Ravenswood Ave., Chicago.

HARDINGE

Fuel Oil Burner

Basement Equipment for Type "R" Systems of 16,000 to 32,000 sq. ft., e. d. r. consisting of Duplex Vent Trap two size 323 Boiler Return Traps—used in many large telephone exchange buildings.



"Telephone Town" uses many Type "R" Systems

Scores of telephone buildings, offices and exchanges are equipped with Webster Systems of Steam Heating. The few shown here, located in three cities, are typical examples of the outstanding telephone buildings in scores of cities, heated by Webster Vacuum Systems or Webster Type "R" Systems—the choice of system being dependent on the particular conditions involved. For branch exchange buildings the Webster Type "R" System is particularly desirable because of its simplicity and ease of operation.

A telephone exchange requires heat twenty-four hours a day during the winter months. Well maintained telephone service must have heating that is adequate, uniform and unfailing. Only when thoroughly warm and comfortable can operators work with swiftness and accuracy.

Follow the lead of contractors who have made a success of telephone company business. Submit your bid on the basis of a Webster Type "R" System. You will find telephone executives receptive to such quality ideas as are expressed by Type "R" installations.

The Webster Steam Heating Specialist in your vicinity can no doubt help you in developing preferred business—with more profit, more satisfaction and more pride in it for you. It is suggested that you get in touch with him.

–since 1888 **Webster** Systems of Steam Heating

The Webster Steam Heating Specialist in your vicinity can probably help you in developing PREFERRED *business with Webster Type "R" Systems. Get in touch with him.*

WARREN WEBSTER & COMPANY
Pioneers of the Vacuum System of Steam Heating
CAMDEN, NEW JERSEY
Branches in 52 principal U. S. Cities. In Canada—Darling Bros., Ltd., Montreal

a R 18 HC

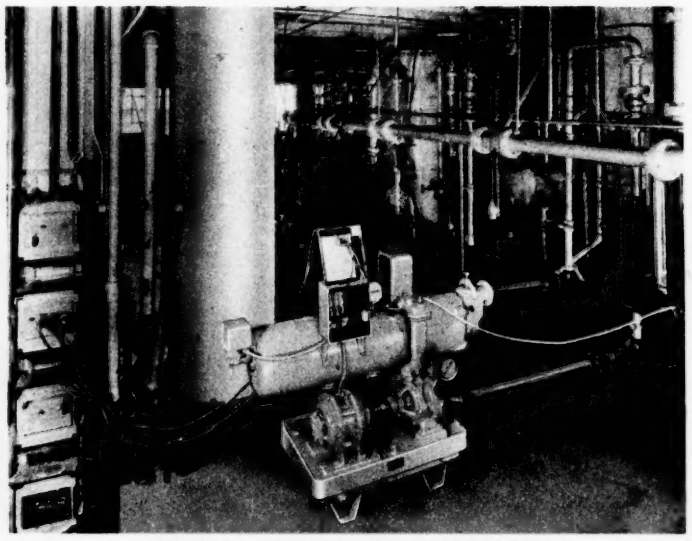
WARREN WEBSTER & COMPANY, Camden, New Jersey.
Please mail Bulletin B-600 describing the Webster Type "R" System of Steam Heating to

Name..... Street..... City.....

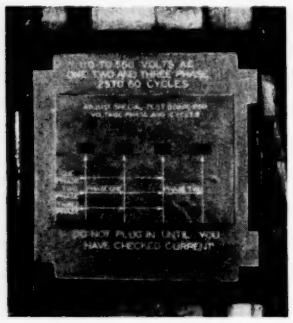
Stretching square foot pump ratings will not fill the bill

Combined Air and Water Capacity determines the amount of radiation a heating pump can serve

ALTHOUGH it is usually possible to calculate within close limits the volume of condensation to be removed from a steam heating system, the quantity of air to be exhausted may vary greatly. The degree of tightness, the efficiency of radiator traps, the temperature of the condensate, the cooling effect of the return piping, the use of lifts, the relative quantity of fan surface installed, the vacuum to be maintained, the necessity of introducing high temperature water into return piping near the pump, and the use of long runs to the radiator, are certain to vary.



GENERAL VIEW OF NASH TEST PLANT



TYPE OF SWITCHBOARD PLUG-IN BOX IN NASH TEST PLANT WHICH FURNISHES ELECTRIC CURRENT OF ANY PHASE, VOLTAGE AND FREQUENCY

No wonder the volumes of condensation and air to be removed from two such systems having the same radiation surface may differ greatly!

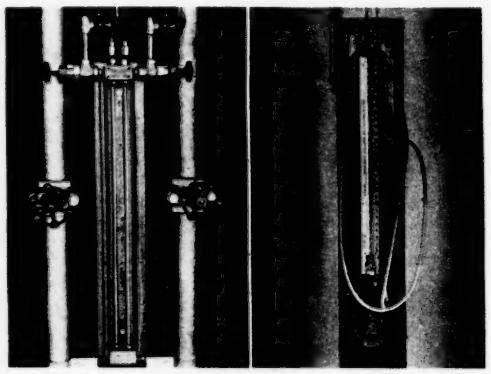
So, the determining factor in recommending the correct size of vacuum pump for a given heating system is the maximum quantity of air the pump will ever be called upon to remove from the system.

Nash Engineers have recognized these facts for years. They have always rated Jennings Return Line Vacuum Steam Heating Pumps on the basis of their combined water and air capacity.

CAPACITIES OF JENNINGS VACUUM HEATING PUMPS

Pump Size	Equivalent Direct Radiation Square Feet	Water Capacity G.P.M.	Air Capacity Cu. Ft. Per Min.	Orifice Diameter Inches	MOTOR HORSEPOWER			
					10 Lbs.	20 Lbs.	30 Lbs.	40 Lbs.
T	2,500	4	3	3/64	½	½	1	1½
U	5,000	9	3	3/64	½	½	1	1½
V	10,000	14	6	5/32	1	1	1½	2
B	16,000	22	9	3/16	1½	2	3	5
C	26,000	35	15	¼	2	3	5	5
D	40,000	60	19	9/32	3	5	5	7½
E	65,000	90	34	3/8	5	5	7½	10
F	100,000	140	50	7/16	7½	10	15	15
*G	150,000	200	102	9/16 & 5/8	10	15	UPON REQUEST	
*H	300,000	400	171	2-3/16 & 1-9/16	UPON REQUEST			

* *The last two sizes are out of the manifold type.*



TYPES OF VENTURI METER AND VACUUM MANOMETER USED IN TESTING JENNINGS PUMPS

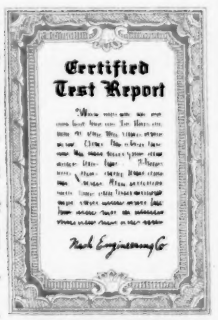
Jennings Pump Capacities Are Determined by Actual Tests

This combined capacity is definitely established before each pump is shipped from the factory. Exhaustive tests conducted in a completely equipped laboratory accurately determine the volume of water in g.p.m. that the pump can remove from the receiving tank under a prescribed vacuum and deliver against a specified discharge pressure. Simultaneously, a calibrated orifice checks the number of cu. ft. per min. of air that the pump can withdraw from the receiving tank and discharge into the atmosphere. A certified report of these tests is furnished to the customer on request.

STANDARD TEST ORIFICE

Ratings Are Reliable Under Varying Conditions

Jennings Vacuum Heating Pump ratings are reliable. They are based on actual performance. A Jennings Pump, with the capacity given in the table, can be depended on to serve *any* reasonably well installed system, for which it is recommended, for the life of the building.



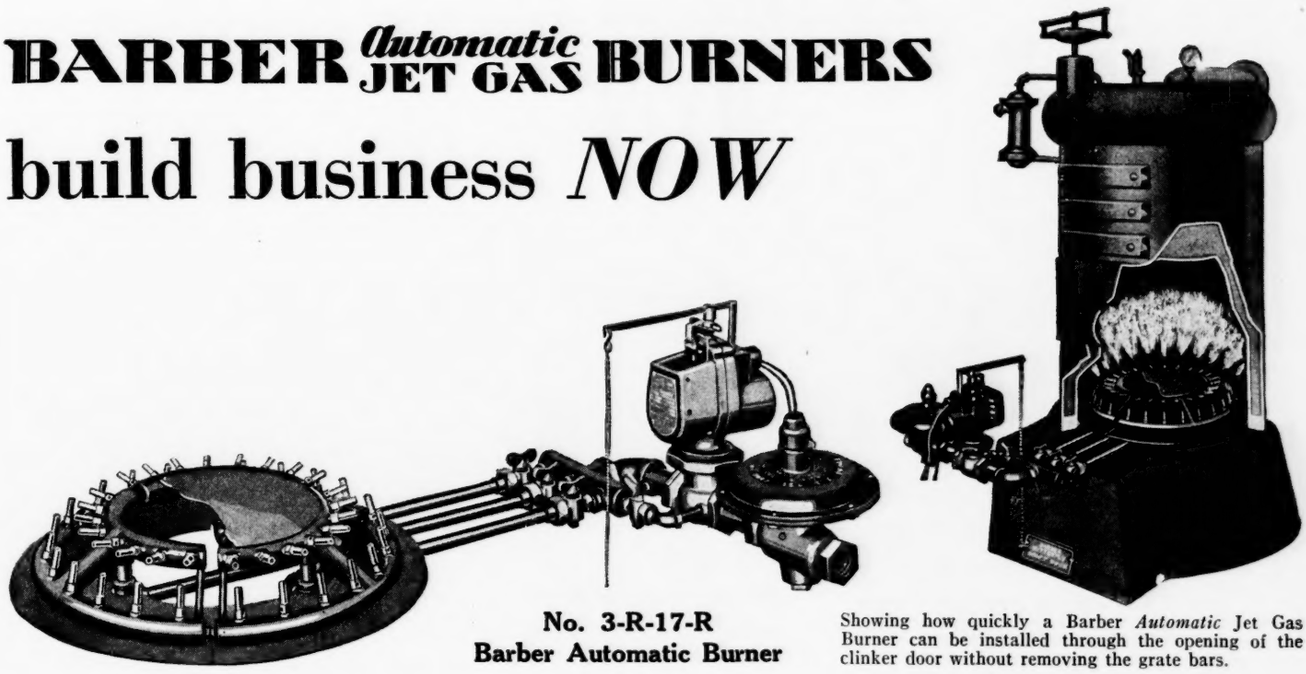
CERTIFIED REPORT OF TEST

Jennings Pumps

NASH ENGINEERING CO.
SOUTH NORWALK, CONN., U. S. A.

QUICK INSTALLATIONS

BARBER *Automatic* JET GAS BURNERS build business *NOW*



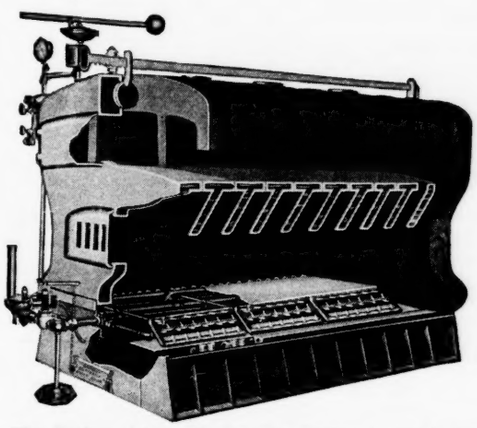
No. 3-R-17-R
Barber Automatic Burner

Showing how quickly a Barber *Automatic* Jet Gas Burner can be installed through the opening of the clinker door without removing the grate bars.

A COMPLETE AUTOMATIC CONVERSION GAS BURNER LINE — FOR 90% of your inquiries, at prices attractive to every home owner.

Barber Automatic Burners (as illustrated above) include the following items—all completely assembled:

Complete Burner Assembly, including Upper and Lower Baffles, Manifold, and Gas Shut-off Cocks to each Burner Unit.
Bypass Assembly for Pilot Supply.
Butterfly Draft Door Assembly.
Butterfly Draft Door Lift Assembly.
B-2210 Minneapolis Motor Gas Valve.
Minneapolis Room Thermostat.
Gas Pressure Regulator.



The Barber *Automatic* Jet Gas Burner is made for all sizes of round and rectangular furnaces and boilers.

WITH all its advantages for boosting gas as the ideal house fuel, winter has one big drawback. It is the most difficult time to install a gas furnace or boiler—but Barber Automatics are easily and quickly installed.

Quick installations with Barber ***Automatic*** Jet Gas Burners build business ***now.*** No delay until spring before making the change. No waiting for new business — and satisfied customers.

Before your customer's house becomes cold from extinguishing his coal fire, you can have a Barber Automatic Burner in efficient operation. Simply clean out the coal fire and ashes in his furnace and install the burner equipment. Make a few necessary connections and adjustments. Light the burner.

Such "Barber Automatic Conversions" show efficiencies ranging from 75 to 82 per cent. For you have the benefit of our 12 years of experience in this field. By sending us the ***specification sheet*** with the ***trade name, number*** and other ***data*** on the ***furnace*** or ***boiler,*** we are able to ship you the correct Barber Burner. It will fit like a suit of tailor-made clothes on the human form.

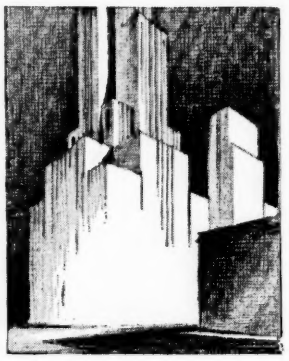
Details about conversions with Barber Automatic Jet Gas Burners are Contained in "The Ultimate Achievement in Simplified Home Heating." Write today for copy, also prices and trade discounts.

***The* CLEVELAND GAS BURNER & APPLIANCE CO.**
Burner Specialists
3702-04 Superior Avenue, Cleveland, Ohio

Sylphon

Leadership

AND THE NEW YEAR



From a seemingly fantastic idea, in twenty-five years to the world's largest exclusive manufacturers of thermostatic instruments may seem "luck" to some people—but to us it represents only the accumulated effort of right thinking and concentrated application.

We are proud as we look back and view our past, at the beginning of this New Year. Not in the spirit of boasting, but rather of serving. The road hasn't always been smooth for one of the hardest things to do is to help others to help themselves. Why you can sell "gold bricks" when you can't sell "gold dollars"—is an idiosyncrasy of human nature that is as hard to understand as to explain.

At this time of general retrospection; of mental stock-taking in all industries—does the progress of your company show the steady growth that you had hoped and expected, or are you barely holding your own, with each year's profits just about the same as last?

We are not efficiency experts, nor is our famous Sylphon Bellows—the most durable, flexible and sensitive expansion unit known—a panacea for all "ills"; but we do know that Sylphon Temperature Regulators will end all your temperature control troubles during the years to come—and that they will help to place your plant in line with other industries for greater growth, efficiency and profit.

Write for Bulletins H 125 and H 175

> > > The above bulletins are enlightening and will be sent to you without obligation. < < <

FULTON SYLPHON CO.

KNOXVILLE, TENN., U. S. A.

European Representatives, Crosby Valve & Eng. Company, Ltd., 41-2 Foley St., London, W. I., England.

Representatives in all Principal Cities in U. S. A.

See our catalogue in Sweets

Canadian Representatives, Darling Bros., Ltd., 140 Prince St., Montreal, Que., Canada.

Your professional reputation can earn dividends for you

You can get extra profits without extra expense by cooperating with Electrol

By combining the force of your own prestige with that of the Electrol Oil Burner, you can tap a new source of income. By working with the Electrol dealer in selling Electrol all-electric automatic oil heat to your clients, you can make oil burner profits without becoming an oil burner dealer.

No investment or increase in overhead is required. The Electrol dealer will cooperate with you fully. He will take care of all installation and technical work. You simply use his facilities to enlarge your own service.

When it comes to oil heat, you will be in the right position to give your customers the best of attention. You will find that most of them already know Electrol. Your recommendation will confirm your client's judgment . . . help to close sales and bring you the commissions.

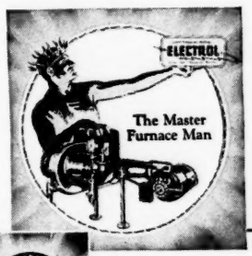
The Electrol Sales and Service Representative in your city will be glad to give you the details of this proposition. If you don't know his name, write us and we will have him get in touch with you.

ELECTROL INCORPORATED
227 East 45th Street New York City

Send for these new bulletins: "The Electrol Oil Burner Is Adaptable to All Types of Heating Systems" and "Household Heat and a Year-Round Hot Water Supply with the Same Electrol Oil Burner" have just been published for the information of heating men. Copies will be mailed free upon request.

Share in Electrol's Success

Scoring gains in every phase of its business and gaining particularly in the notable additions made to its executive staff in 1929, Electrol has just completed the most conspicuously successful year in its history. 1930 finds Electrol organized for even greater success . . . success in which the heating contractor who recommends Electrol automatic heat to his clients will share.



MEMBER OIL HEATING INSTITUTE

ELECTROL

The* OIL BURNER *with the Master Control

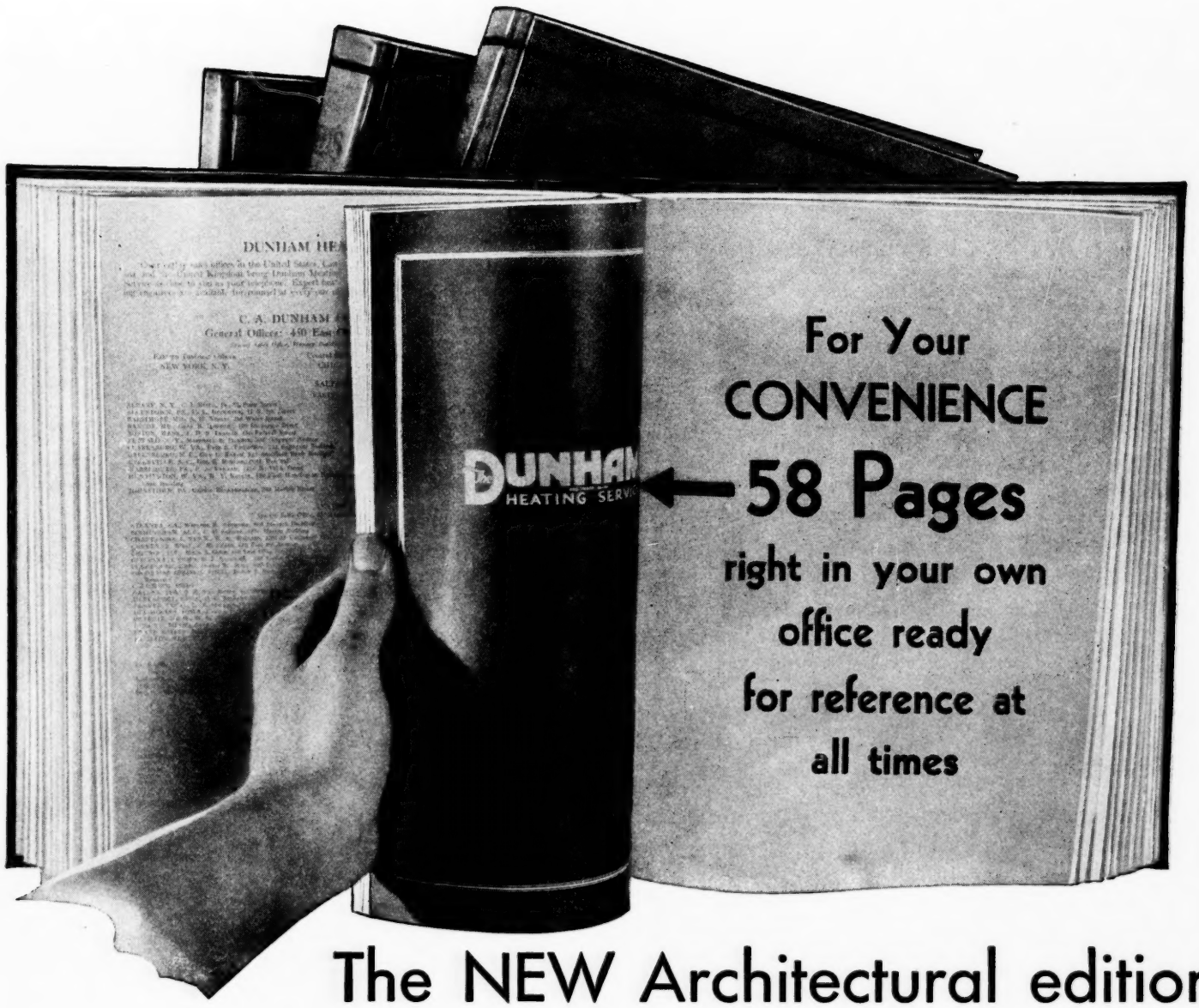
LISTED AS STANDARD BY THE UNDERWRITERS' LABORATORIES

Electrol Incorporated,
227 E. 45th St., New York City, N. Y.
Please send me copies of the two bulletins described in current issue of Heating and Ventilating.

Name.....

Address.....

City.....



The NEW Architectural edition of the DUNHAM HANDBOOK is in Sweet's

Over 800 installations in all types of buildings, many of them replacing other heating systems, show fuel economy that can only be described as remarkable. Savings from 25 to 40% are fully authenticated. Combine this with control so perfect that occupants are not conscious of the heating system and you will see why those who know Dunham Heating are enthusiastic about it.

Complete data on the exclusive design and operating features of Dunham Differential Heating is published this year as a 58 page section of Sweet's Architectural Catalogs. All the essential information for heating system layout is included in convenient form, with tables of pipe sizes, radiation requirements, dimensions, and installation and operating data as well as specifications adaptable to all types of buildings.

This handbook will be supplemented by the complete Dunham service which is available from each of the 80 sales offices listed.

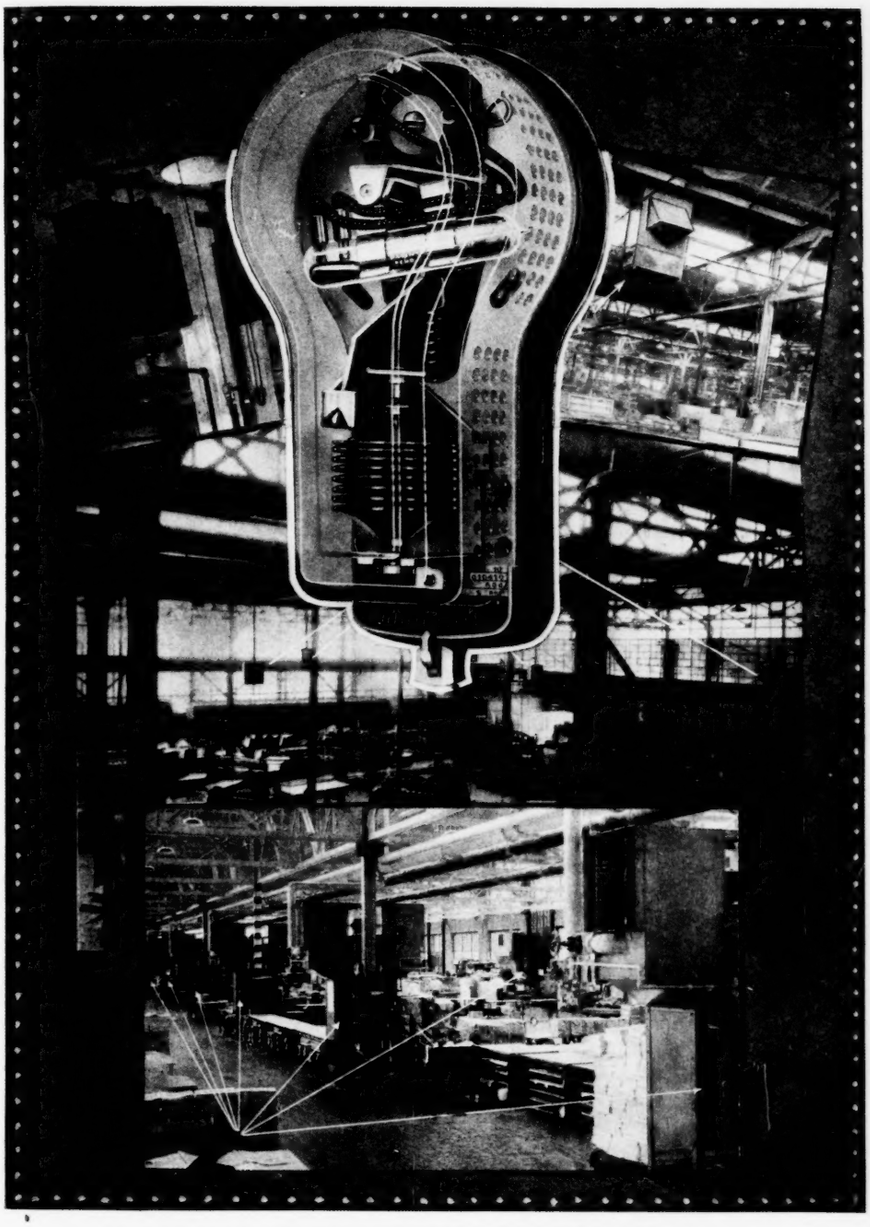
Look through the blue-cover Dunham section in Volume D of Sweet's 1930 Catalogs now. Consult its 58 pages of data when you plan the heating system for any client who will appreciate 25 to 40% fuel savings PLUS the finest character of heating service.

C. A. DUNHAM CO.

Dunham Building

450 East Ohio St., Chicago, Ill.

START THE NEW YEAR WITH MERCOID CONTROLS AND NOTE THE IMPROVEMENT



The above Illustration shows the Mercoid Thermostat and several unit heater installations using Mercoid Controls

The Mercoid Thermostat is the leading control for unit heater application.

It is dependable, accurate and has a record for its unfailing performance.

Complete Catalog Sent Upon Request

THE MERCOID CORPORATION

564 W. ADAMS STREET, CHICAGO, ILLINOIS

25 Church St., New York 1129 Folsom St., San Francisco

MERCOID CONTROLS

Time-O-Stat enters 1930 with the finest and most complete line of automatic controls it has ever offered. Many are improved in design, appearance, and usefulness.

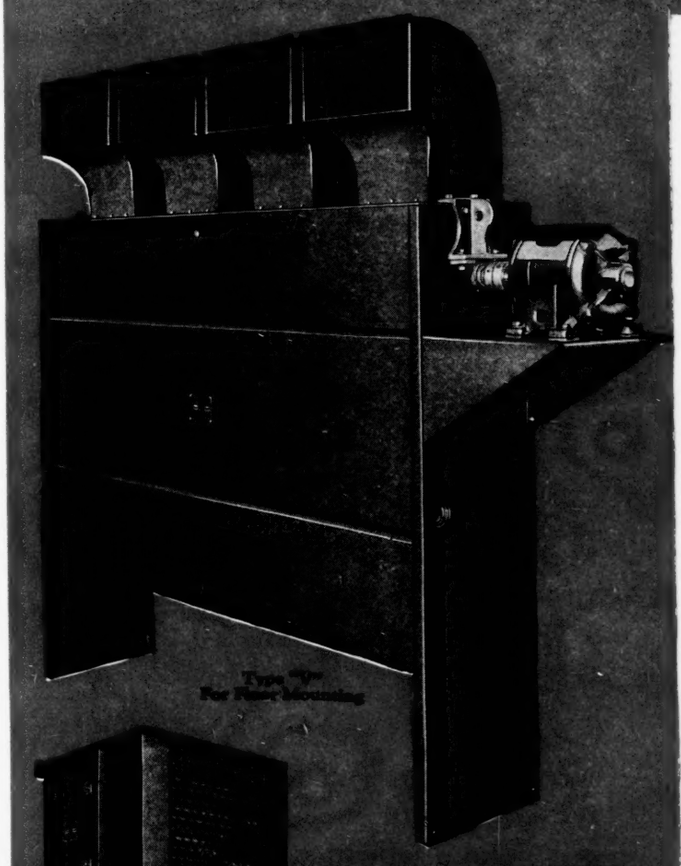
Too, Time-O-Stat enters 1930 as a national organization, with Distributors and service organizations in 26 industrial centers of the United States and Canada. All are equipped to give quick delivery and friendly co-operation to every Dealer and user of automatic controls.

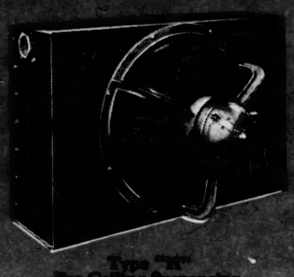
And in 1930, as before, Time-O-Stat's extensive research laboratories welcome the opportunity to work out individual problems of automatic control.

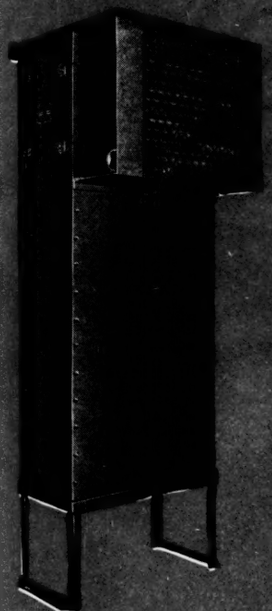
TIME-O-STAT
CONTROLS COMPANY
ELKHART, INDIANA

Manufacturers of AUTOMATIC CONTROLS for Oil Burners · Gas Burners · Coal Burners · Electric Refrigerators · Furnace Fans · Mechanical Stokers · Industrial Ovens · Ice Machines · Unit Heaters · also of Sign Flashers · Mercury Switches · Electric Heaters · Corrugated Metal Bellows

Massachusetts Unit Heaters







A Size and Type for Every Requirement

Massachusetts Unit Heaters are manufactured in three distinct types and numerous sizes to meet every requirement for efficient and economical heating and ventilating of large areas such as manufacturing plants, factory offices, garages, etc., and in addition, applications are found in the industrial drying field.

Massachusetts Unit Heaters are being very largely used in new factory construction, and owing to their ease of installation and lower expense are also ideally adapted for older buildings where changes and revamping operations are being made.

Massachusetts Unit Heaters are manufactured complete in our large factories in Cleveland. We build both ceiling and floor types, utilizing either steam or hot water. Our engineers will be glad to offer suggestions recommending the type best adapted to your requirements.

The BISHOP & BABCOCK SALES COMPANY, Cleveland, O.

General Offices—4901-4915 Hamilton Avenue, N. E.

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Baltimore Boston Washington, D. C. Bridgeport St. Louis Buffalo Chattanooga Chicago Cleveland Birmingham, Ala. Denver Detroit Little Rock Los Angeles Minneapolis Duluth Memphis Pittsburgh New York Oklahoma City San Antonio Philadelphia Richmond Scotia, N. Y. Spokane Cincinnati Tulsa Tokyo, Japan

BISHOP & BABCOCK

TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

HEATING AND VENTILATING ARE AN IMPORTANT PART OF MANUFACTURING

Are your workmen handcuffed with cold?

Workmen — whose fingers are numb — whose heads are clogged up — whose dispositions are ruined by cold — are inefficient. They make mistakes. Often they are laid up at home with ailments brought on by their faulty working environment.

Inefficient employees are a drain on profits. Mistakes cost money. Absent workmen mean idle machines. When machines stand idle production schedules are ruined and profits vanish. Skinner Bros. Unit Heaters insure conditions conducive to maximum production.

The Skinner representative in your city will be glad to discuss your heating, ventilating or air-conditioning problems with you without obligating you in any way. Telephone him today or write direct to Skinner Bros. in St. Louis, outlining your problems.

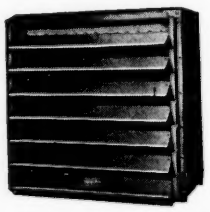
Skinner Bros. Unit Heaters

SKINNER BROS. MANUFACTURING COMPANY, Inc.
1402 S. Vandeventer Avenue, St. Louis, Mo.
Branches in All Principal Cities ***"The Originators of Unit Heating"***

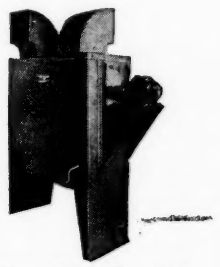
A UNIT HEATER FOR EVERY INDUSTRIAL HEATING AND VENTILATING REQUIREMENT

Skinner Bros. "Baets Patent" Air Heater

Skinner Bros. Patented Direct-Fired Air Heater



Skinner Bros. Patented "Lightweight" Air Heater

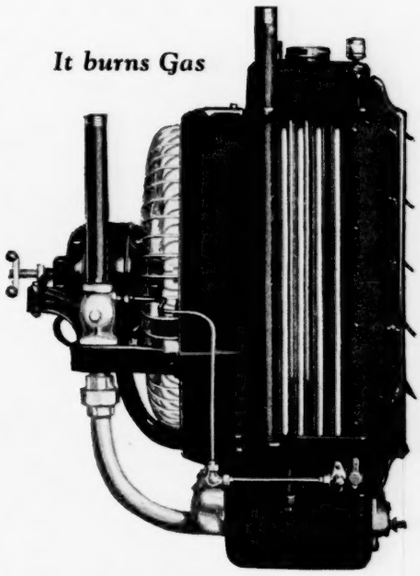


Skinner Bros. Type "U" Air Heater

"... IT IS JUST AS NECESSARY THAT PLANTS MODERNIZE THEIR HEATING AND VENTILATING EQUIPMENT AS IT IS THEIR PRODUCTION MACHINERY. ALL OBSOLETE HEATING SYSTEMS ARE FAR TOO EXPENSIVE TO MAINTAIN IF PRODUCTION COSTS ARE TO BE TRIMMED ALL ALONG THE LINE IN ACCORDANCE WITH THE DEMAND OF PRESENT DAY COMPETITION."

—FACTORY AND INDUSTRIAL MANAGEMENT
(A McGRAW-HILL PUBLICATION)

It burns Gas

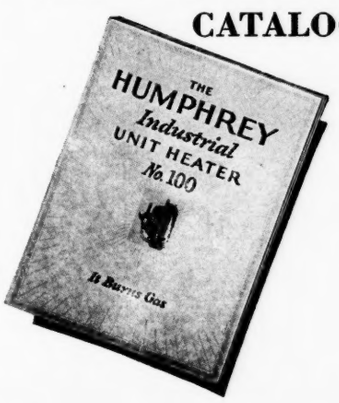


See the Unit Heater in operation at the International Heating and Ventilating Exposition at Philadelphia, Booths No. 206 and No. 207.

The Humphrey Industrial Unit Heater provides the most efficient type of modern industrial heating. Its use in scores of plants throughout the nation is the most practical kind of testimony of its efficiency and economy. These self contained gas-burning units, which transform cold air into hot air with incredible speed, are suspended from the ceiling—requiring no valuable floor space. The heat is directed downward where it is most needed to warm cold floors and corners. Ready to supply abundant warmth at the turn of the valve, the Humphrey Industrial Unit Heater provides the most flexible and easily controlled heating service known to industry.

Eliminating both the waste of overheating and the inefficiency of under heating it economically maintains a uniform, healthful temperature throughout the cold and damp seasons of the year. The Humphrey Industrial Unit Heater catalogue is yours for the asking.

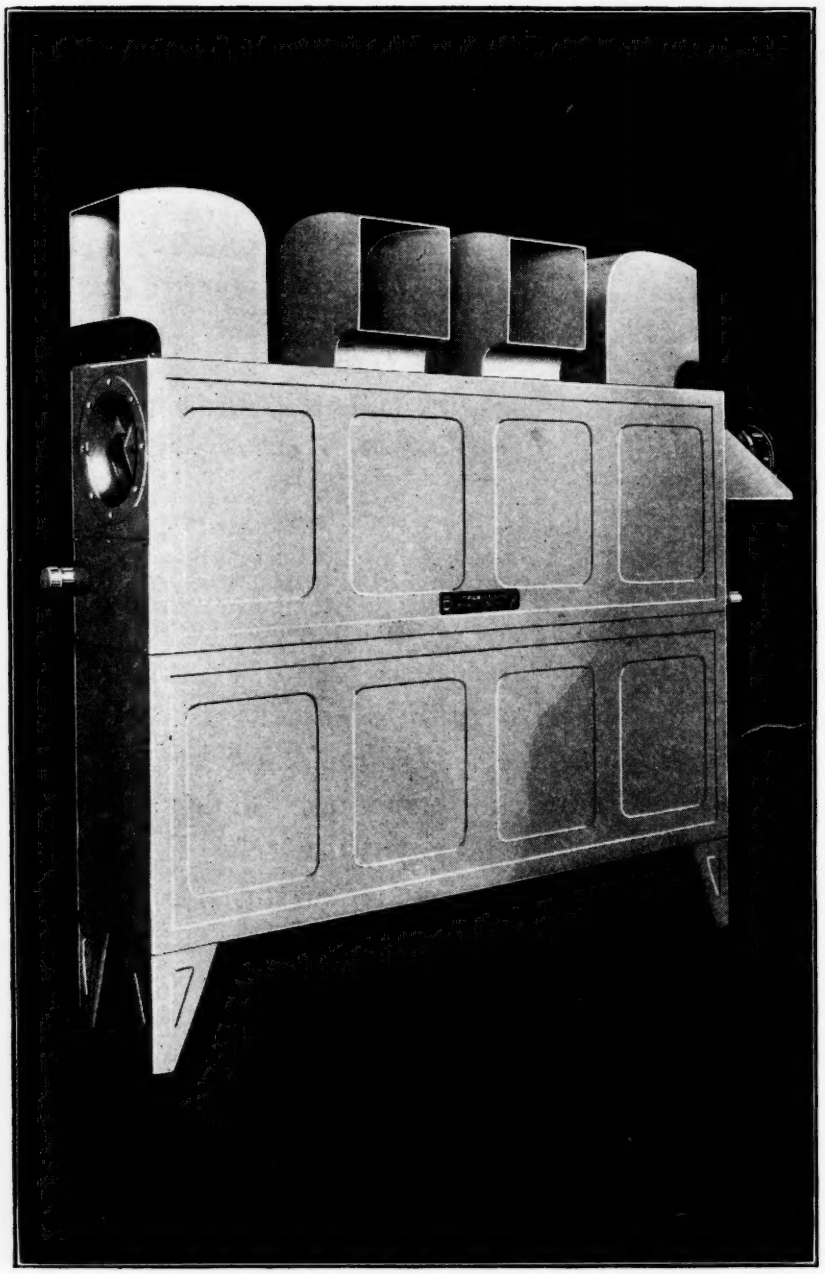
SEND FOR THIS CATALOGUE!



GENERAL GAS LIGHT COMPANY
KALAMAZOO MICHIGAN
NEW YORK
44 WEST BROADWAY
SAN FRANCISCO
135 BLUXOME STREET

The Humphrey
Industrial Unit Heater

QUALITY



IN SIGHT AND INSIDE !

The youthful unit heater industry has progressed beyond the days of a heating coil and a fan.

Users can now obtain units that are not only efficient but good-looking. The new Buffalo Highboy and Lowboy Heaters have paneled steel casings, welded for long life and neat appearance. They may be had in a large number of different arrangements to fit the needs of the location. The sturdy, simple bracket for motor mounting is the most effective yet devised. Modern color dresses the unit for the modern shop.

Inside, fine materials are combined with fine workmanship also. "Universal Aerofin" heating coil is used, light weight, strong, non-corrosive. The fans are Buffalo designed and built—quiet and efficient, each operating in separate housings. A sturdy fan shaft is supported by self-aligning ball bearings.

In every respect, Highboy and Lowboy Heaters will exceed your expectations. We'll be glad to recommend suitable equipment for your plant.

Buffalo Forge Co.

480 Broadway, Buffalo, N. Y.

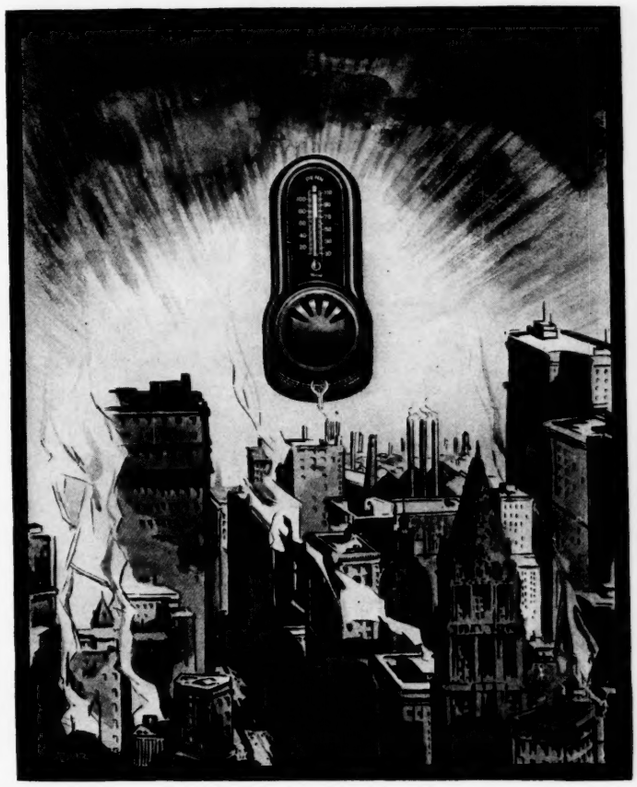
IN CANADA: Canadian Blower & Forge Co., Ltd., Kitchener, Ontario.

"Buffalo"

Lowboy, Highboy
AND
Wetboy Unit Heaters

The Penn Thermostat

. . Simplifies The Wiring Job For Unit Heaters . . .



AT THE INTERNATIONAL EXPOSITION
BOOTH NO. 548

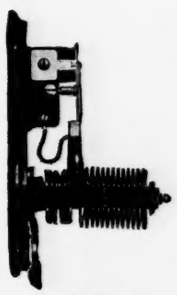
NOW you can make unit heater installations with a minimum of wiring expense. This new Penn Thermostat, specifically designed for across-the-line service, carries the load direct, even up to 1 H.P., single phase, A.C., and ⅓ H.P., direct current. It embodies the exclusive Penn magnet structure, eliminates the use of magnetic contactors, relays, and transformers for these sizes. It is also suitable for pilot service up to 550 volts A. C. for use on larger motors of the above ratings and three-phase motors which must be protected against single phasing.

In addition to the enormous capacity to carry heavy current loads direct, the Penn Thermostat may be mounted easily and quickly (no plumb and level needed) without affecting its setting. Quick response to temperature changes (less than 2 degree differential) makes it possible to maintain uniform heat and assures economical operation. The durability and dependability of Penn Thermostats have been proven hundreds of times under tests and actual service conditions.

For lower initial costs, fewer service calls, and greater sales, you can recommend and install no better control for unit heaters than the Penn Thermostat. Manufacturers, write for complete information and standard thermostat for test purposes.

Listed as Standard by Underwriters' Laboratories. Prices in keeping with other standard makes.

A Special Room Thermostat for current loads up to 30 amperes A.C. can be supplied for electric space heaters, etc.



Side View
Type A Penn Room
Thermostat Cover
Removed

Manufactured by an organization of proven engineering ability that supplies the largest and best concerns of the country with automatic control switches

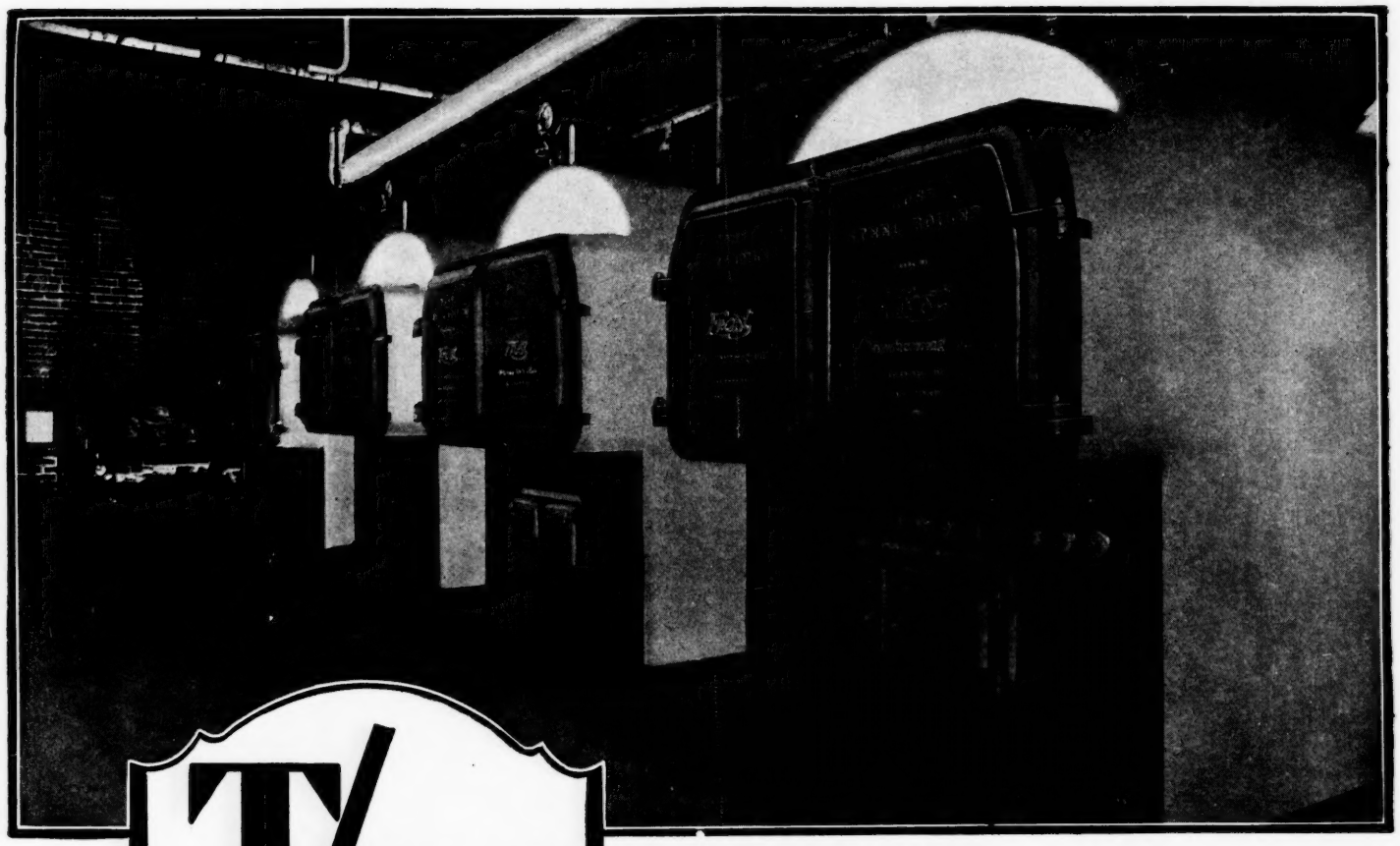
PENN ELECTRIC SWITCH CO.
DES MOINES, IOWA

A COMPLETE LINE OF AUTOMATIC ELECTRIC SWITCHES FOR

Oil Burners, Pumps
Refrigerators
Air Compressors

Thermostat Switches
Float Switches

Unloader Pilots
Vacuum Switches
Pressure Switches



The CHOICE of the Discriminating

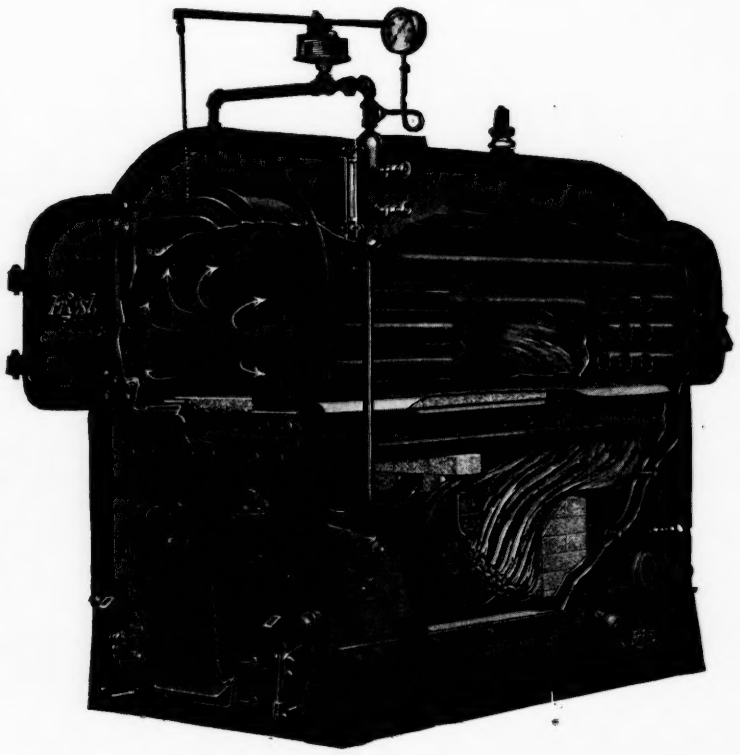
. . . The ten best features for steam or hot water heating are found in the Ross Steel Heating Boiler.

1—Unrestricted circulation.
2—Smokeless.
3—Unusually large direct heating surface.
4—Full length self-cleaning convex crown sheet.
5—Tubes easily cleaned from outside.
6—One large body of water.
7—Indestructible smokeless arch with circulating baffles.
8—Large central flue.
9—All seams electrically arc welded—tubes expanded in heads.
10—Three-pass fire travel.

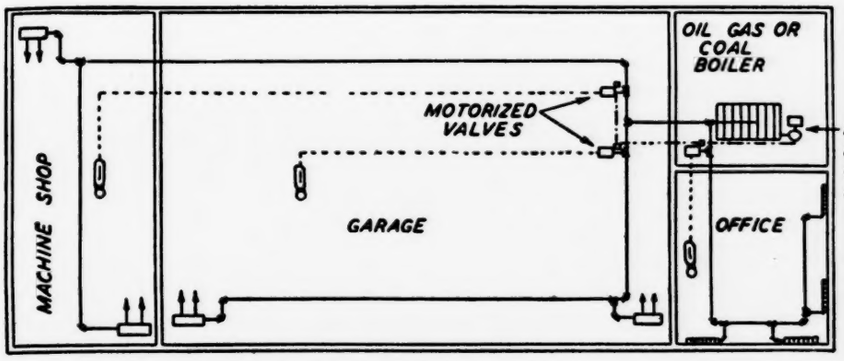
Write for Catalog—
Ideal for Oil or Gas Burning

The Frost
MANUFACTURING COMPANY
Galesburg, Illinois

Branches in Most Leading Cities



ROSS STEEL BOILERS



AUTOMATIC CONTROL

FOR EVERY TYPE OF UNIT HEATING SYSTEM

Every heating system presents a control problem individual in itself. The types of buildings, character of activities in various departments, capacities and types of heating units, day and night temperature requirements and a score of other important factors must be given proper consideration before a satisfactory control system can be planned.

Minneapolis-Honeywell controls are designed to meet the varying conditions in different layouts. Unit Heaters can be controlled individually, in batteries, or grouped with direct radiation. Full automatic control can be extended to the heat producing mediums where desired.

We will gladly help you plan the control system which will be most economical and satisfactory for the conditions under consideration.

Use the coupon for convenience.

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INDUSTRIAL REGULATORS
HONEYWELL

MINNEAPOLIS-HONEYWELL REGULATOR COMPANY
Executive Offices: 2715 Fourth Ave. So., Minneapolis, Minn.
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MINNEAPOLIS-HONEYWELL REGULATOR CO.
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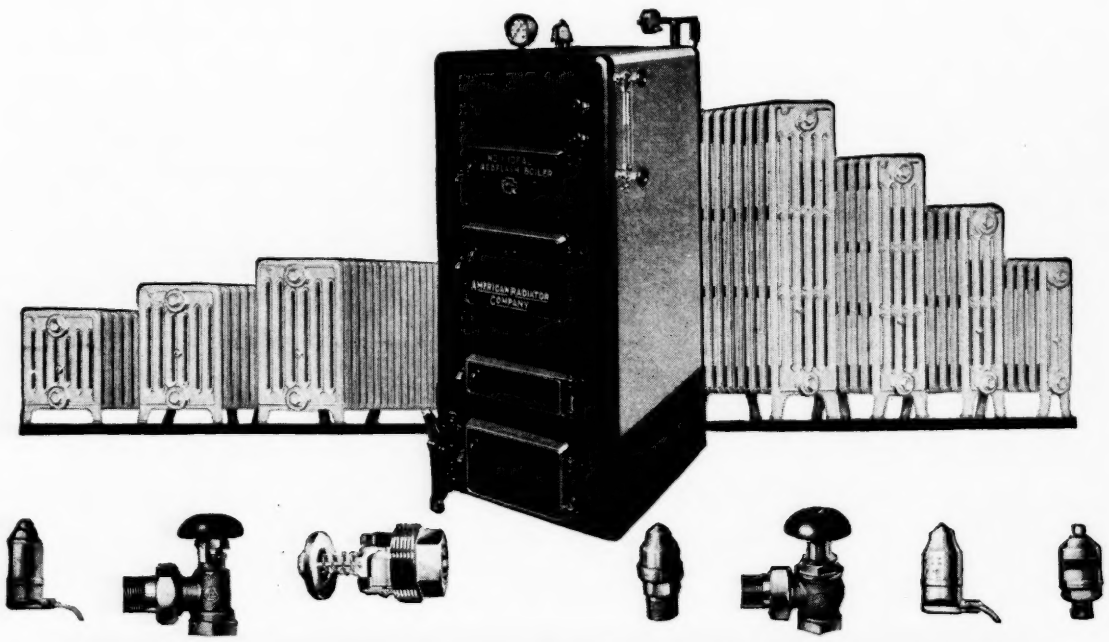
☐ Send me your pamphlet on Unit Heater and Sectional Control Systems.
☐ Have representative call. I understand there is no obligation.

Name..... Position.....
Company.....
Address.....
City..... State.....

This INSTALLATION paid for itself in SEVEN MONTHS

4 family house, Newark, N. J., with modernized heating
Heating Contractor: Joseph Soriano, Newark, N. J.

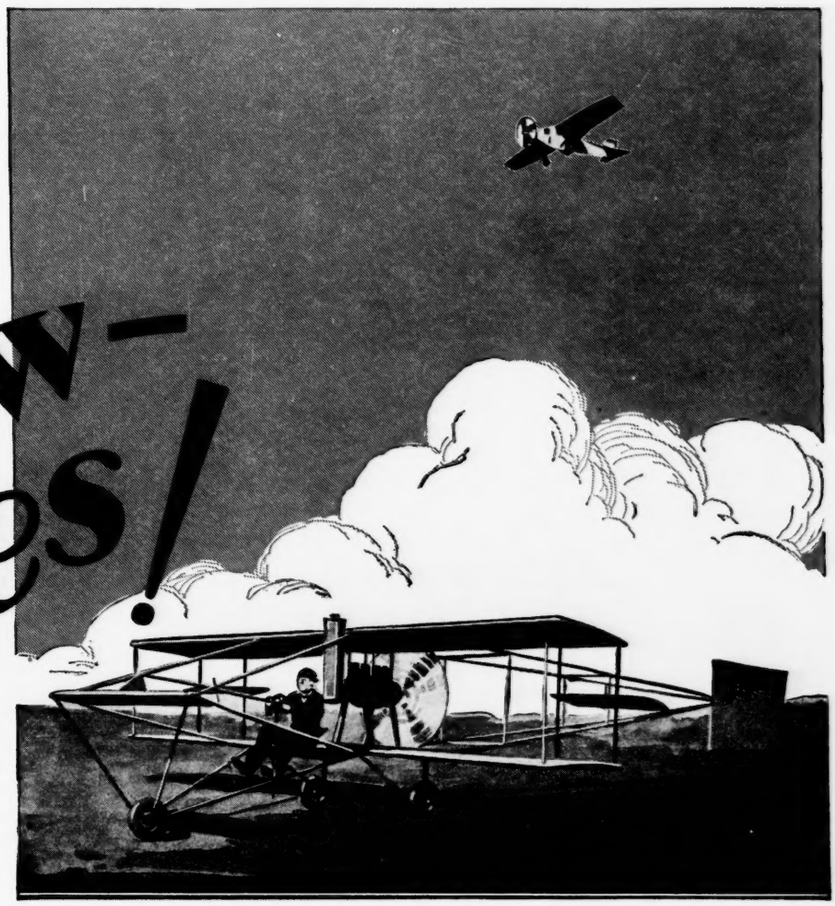
WHEN the heating contractor sold the order for the installation of a modern American Radiator Heating Plant in this building he was actually making the owner a present of an additional income of $120 a month. The cost of the installation was $850—the rent before installation was $50 per apartment—the rent today is $80 per apartment—and the tenants are more than satisfied. Right in your own neighborhood there are countless buildings where an "All-American" Heating Plant can do the same thing . . and put money in your pocket.



AMERICAN RADIATOR COMPANY

40 WEST 40th STREET, NEW YORK

IT FLEW— yes!



HEATING HAS CHANGED TOO!

THIS page is dedicated to those who say that "old style equipment is good enough" . . . . Improvements have come — in all lines . . . They must be recognized.

Modine Unit Heaters are the outstanding development for industrial heating. With Modines you *heat as you light* — deliver heat down over a wide floor area and keep it down in the working zone, just as light is reflected down where needed. The result is better heating at lower cost. Our newest catalog will give you complete facts. Send for it today.

Modine Unit Heater — Model 701 — the original copper radiation equipment — weighs only 130 lbs. — suspends from the steamline — replaces approximately 2½ tons of cast iron radiation.

MODINE MANUFACTURING COMPANY
1707 Racine St. (*Heating Division*) Racine, Wis.
Branch offices in all large cities
London Office: S. G. Leach & Co., Ltd., 26-30 Artillery Lane.

Modine Unit HEATER

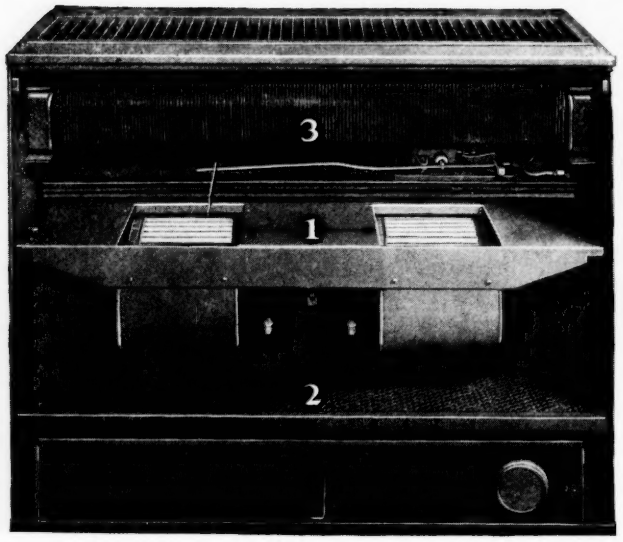
A MODINE Product

FOR STEAM, VAPOR, VACUUM, HOT WATER HEATING SYSTEMS

HEAT AS YOU LIGHT

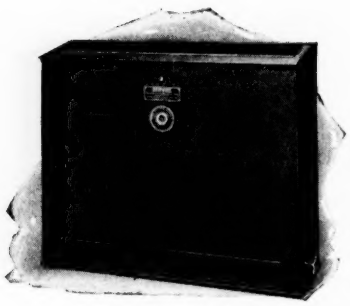
Mr. Architect

Your Reputation is Safe *when* *You Specify* PEERVENT



1. **Motor driven fans**
2. **Air filter**
3. **Peerfin Radiator**

TO say that Peerless originated the Unit System of heating and ventilating eighteen years ago gives you but a part of the picture, for at that time Peerless had specialized for twenty-two years in heating and ventilating. Thus its *first* Unit System was a development from *twenty-two years' experience.* Judge for yourself whether or not its conception and execution was adequate —its very first installation is in service today and giving complete satisfaction.



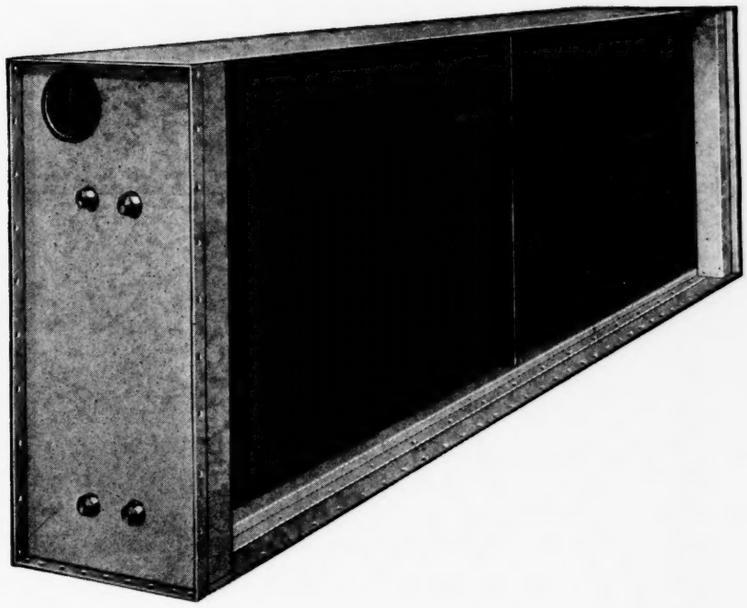
PeerVent throughout the years, has been progressive. It has watched and carefully studied the changing conditions in building construction, and from time to time altered and improved its unit equipment, and thus kept far ahead of its own industry — evidenced again by the widespread preference for PeerVent Unit Systems.

PeerVent present-day Units are scientific developments which meet the full requirements of the most modern building construction. Write for the PeerVent book describing PeerVent Heating and Ventilating Units.

Peerless Unit Ventilation Co., Inc.
Pioneers in Unit Ventilation
Bridgeport, Connecticut
Sales and Service Organizations in all Principal Cities from Coast to Coast

PEERVENT

Heating and Ventilating Units



ARCOBLAST

ENCASED HEATERS

WHEN the Heating and Ventilating Apparatus is located overhead in Theatres, Auditoriums and other Public Buildings and the construction of the building will not permit additional weight then ENCASED ARCOBLAST should be selected by the HEATING ENGINEER.

The design of ENCASED ARCOBLAST having three-quarter inch copper tubes with spirally wound fins secured into specially shaped cast iron headers gives good THERMOSTATIC CONTROL.

The encasement is rigid and complete made of black sheet metal, galvanized after being made and left ready for pipe connections.

Built for STEAM PRESSURE from 5 to 200 pounds and all sections shop tested up to 750 pounds Hydrostatic.

We will be glad to send you CATALOGUE giving complete information and engineering data.

AMERICAN RADIATOR COMPANY

40 West 40th Street, New York City 816 South Michigan Avenue, Chicago

Heresy then—

Business now

A FEW short centuries ago, they burned people at the stake for things less serious than trying to change the weather.

Modern science has shown Business how to make its own indoor weather — thereby promoting the health and efficiency of the worker — speeding and improving production processes—making homes more livable.

Heating, ventilating and air-conditioning have made their greatest strides during the past few years.

Visit this outstanding event—See for yourself how modern homes, offices, mills, mines and factories should be heated, ventilated, and air conditioned. Talk to specialists who will be in attendance. Keep step with progress! January 27th to 31st inclusive, at the Commercial Museum, Philadelphia, is your opportunity to examine, compare and select the newest and best for your particular needs. Remember the date. Don't miss it!

International Heating & Ventilating Exposition

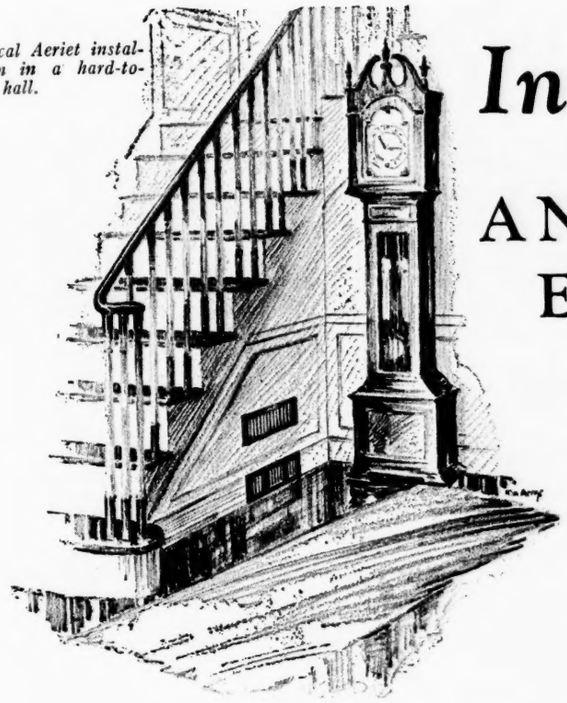
Under Auspices American Society Heating & Ventilating Engineers

International HEATING & VENTILATING EXPOSITION Commercial Museum PHILADELPHIA

Commercial Museum, Philadelphia, January 27 to 31, 1930

Management International Exposition Co., largest industrial exposition organization in the world

8715



Typical Aeriet installation in a hard-to-heat hall.

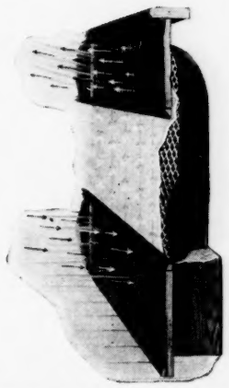
Introducing

A New Equipment and a New Era in Domestic Heating

WHOLLY enclosed within walls and partitions, the motor-driven Air-Way Aeriet projects *warmed air*—not heat—from concealed units in each room, warming from the lowest level up, rather than from the ceiling down, positively diffusing the desired temperature evenly throughout the living area of the room. Silent, vibrationless, providing automatic thermostatic control in each room, here at last is the ideal of all architects and engineers made practical and at a cost that puts it easily within the vast market for a new and better heat supply and control. The Air-Way Aeriet is the only motor-driven concealed heating unit for this purpose. Write for complete information and data.

Easily Installed— Simple in Design— Positive in Operation

THERE are no valves to regulate on the Aeriet. The heating element connected to steam or hot water supply line is integrally cast of unbreakable, non-corrosive, heat-conducting alloys. A specially designed, silent, vibrationless electric motor operates the blower-type fan which forces the abundant circulation of air through the unit, utilizing every available B.T.U. The complete motor and fan assembly is readily accessible. The entire compact unit, replacing hundreds of pounds of cast iron radiation, is entirely concealed. It diffuses no heat when not in operation. Individual automatic thermostats in each room electrically switch on the motor the instant the temperature drops one degree, shutting off automatically when the desired temperature is regained.



Sectional view of Air-Way Aeriet installed beneath the window and between partitions. Arrows diagram the movement of the cold air entering and warmed air deflected out into the room instead of rising along the walls as with old and obsolete systems.

Air-Way Aeriet is described, illustrated and explained in a comprehensive book that should be in the library of every architect and engineer. We will gladly send you a copy. Write for it.

Write for this book.

Air-Way AERIET AIR TREATMENT

Please send me the Air-Way Aeriet book.

Name.....

Title.....

Firm.....

Address.....

H-V

AIR-WAY ELECTRIC APPLIANCE CORPORATION

Heating Systems Division **TOLEDO, OHIO**

WING FEATHERWEIGHT

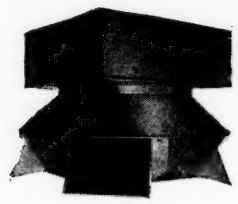
Widespread discharge in all directions

Moderate heights. Square areas

Moderate heights. Long, narrow areas

For high locations. Long, narrow areas

Direct Your Heat Downward Where It Is Needed



1 WING *Featherweight Unit Heaters* direct warmed air downward from their out-of-the-way locations near the roof or ceiling, and distribute it uniformly over the entire working area.

2 Even distribution of warmed air is secured by the use of scientifically designed discharges, of which a variety are available for rooms or buildings of different shapes and heights:

3 Less steam is required because the wasteful accumulation of excessive heat in the overhead spaces is prevented.

4 Less steam is required due to the ease with which any or all of the heaters in a building may be turned off when the desired temperature is reached, either by the throw of a manual switch or by an automatic thermostat.

5 Less steam is required due to the rapidity with which the desired temperature is produced in the building after night or other shut-down periods. The effect of turning the heaters on in a cold building is immediately felt at the working level.

6 Their cost is low because with their multiple discharge outlets a minimum number are required to secure complete coverage of the area to be heated.

7 Their installation cost is low because of their light weight and compactness. Piping is extremely simple and all overhead.

8 Their maintenance cost is low because they need no attention during the entire heating season.

"Heat with Unit Heaters"

L. J. WING MFG. COMPANY

158 W. 14th St. Dept. 1 New York City

UNIT HEATERS

To *Insure* YOU 100% *Satisfaction*

Get Into the Habit of Using

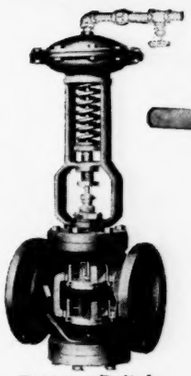
McALEAR'S

Engineering Service

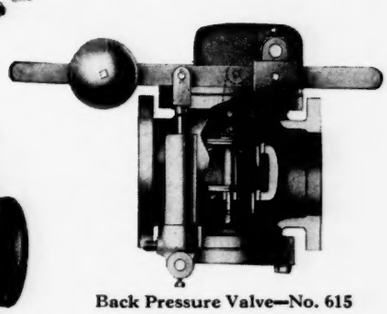
To protect you against any misuse—to assure you the correct equipment for all conditions—to help you solve your pressure and level control problems, McAlear have an engineering service that you are urged to use. These engineers, with over 25 years of field training in the special uses of pressure and level controls, have practical, sound, experience to offer and are fully capable and willing to give their engineering advice on any installation.

This engineering service is maintained solely for your benefit. There are no strings tied to it—no obligations—no charge. Just use it freely.

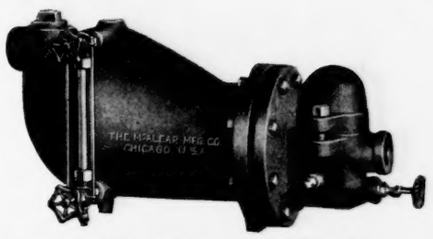
You should have our new 128 page book with its many pages of typical installations, charts, diagrams, blue prints, etc. Send for it.



Pressure Relief Valve— No. 311



Back Pressure Valve—No. 615



Ball Float Steam Trap—No. 725

The McALEAR MFG. CO.

1905 S. Western Ave. Chicago, Ill.

SALES ENGINEERS IN ALL PRINCIPAL CITIES

McALEAR

BUNCOMBE County Court House, Asheville, North Carolina, is entirely equipped with Johnson Control. Johnson Dual Thermostat (Night & Day) Control is on all heat sources. In the main portion of the building, the lower three-quarters, Johnson Control is used on direct radiators. In the jail, or upper section, Johnson Control is on unit ventilators and direct radiators. A separate ventilating equipment in the jail kitchen is also Johnson Controlled. There are a total of 210 Johnson thermostats, 320 valves and 28 ventilating units in this building: another example of the adaptability of Johnson Control to the various systems of heating and ventilating. Write now for the interesting Johnson book of details.

JOHNSON SERVICE CO., MILWAUKEE, WIS.

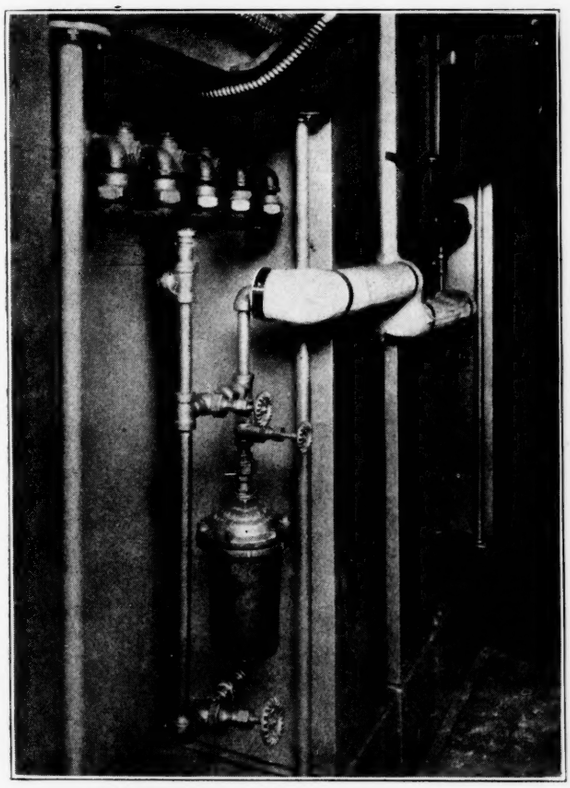
Established 1885

Albany	Des Moines	Portland
Atlanta	Detroit	St. Louis
Baltimore	Greensboro, N.C.	Salt Lake City
Boston	Indianapolis	San Francisco
Buffalo	Kansas City	Seattle
Chicago	Los Angeles	Calgary, Alta.
Cincinnati	Minneapolis	Montreal, Que.
Cleveland	New York	Winnepeg, Man.
Dallas	Philadelphia	Toronto, Ont.
Denver	Pittsburgh	Vancouver, B. C.

Buncombe County Court House
Milburn Heister & Co., Washington, D. C., *Architects*
Sluder Bros., Asheville, N.C., *Heat. & Ventil. Contrs.*

JOHNSON HEAT & HUMIDITY CONTROL

UNIT HEATER BUYERS *are not trap doctors*



Armstrong Traps draining unit heaters in the Pullman Laundry, St. Louis, Mo.

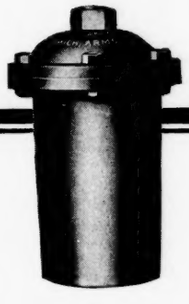
Provide them with Armstrong inverted bucket traps for attentionless service . . . .

ARMSTRONG steam traps keep unit heaters automatically drained of condensate, yet require practically no attention. They cannot air-bind; air, gases and sludges are discharged with the condensate. The upward swirling motion of the water makes them self-scrubbing.

They have capacities greater than most traps of much larger size, yet are small enough to be supported by connecting pipes.

Detailed information as to their operation and application available on request. We are also glad to cooperate with engineers and architects in determining the proper sizes of traps on heating jobs, without obligation.

No. 3 Armstrong Trap, one of the sizes widely used on unit heaters.



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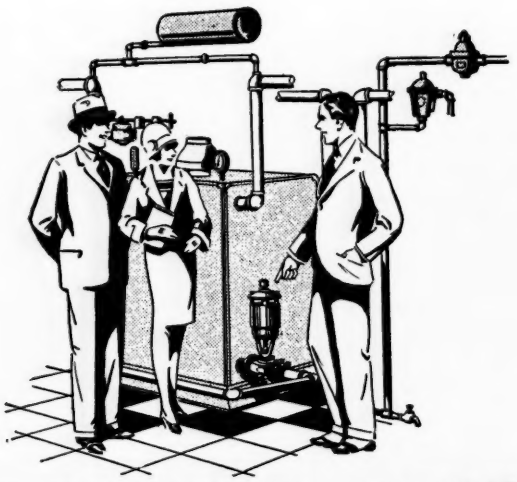

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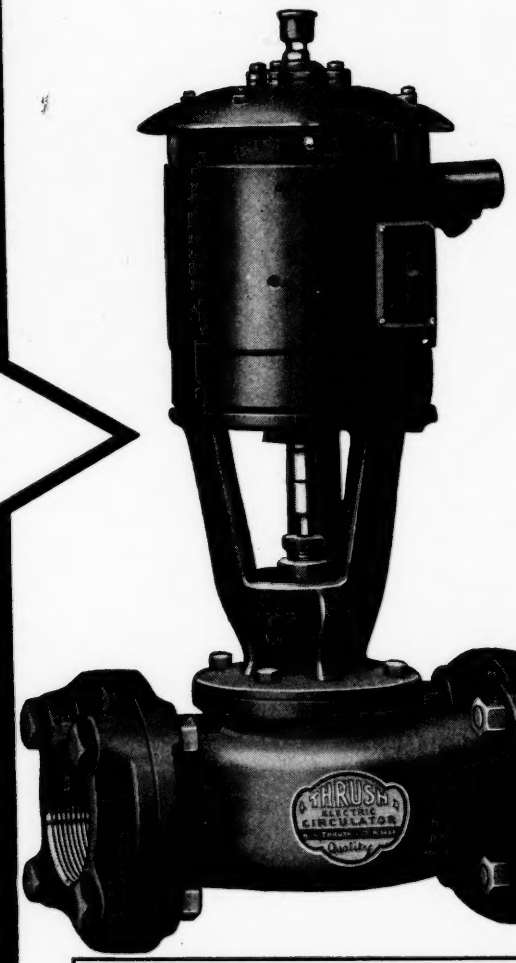

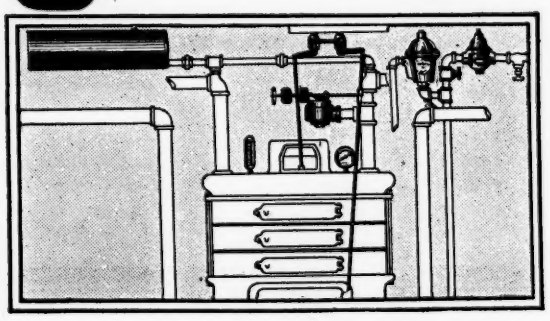

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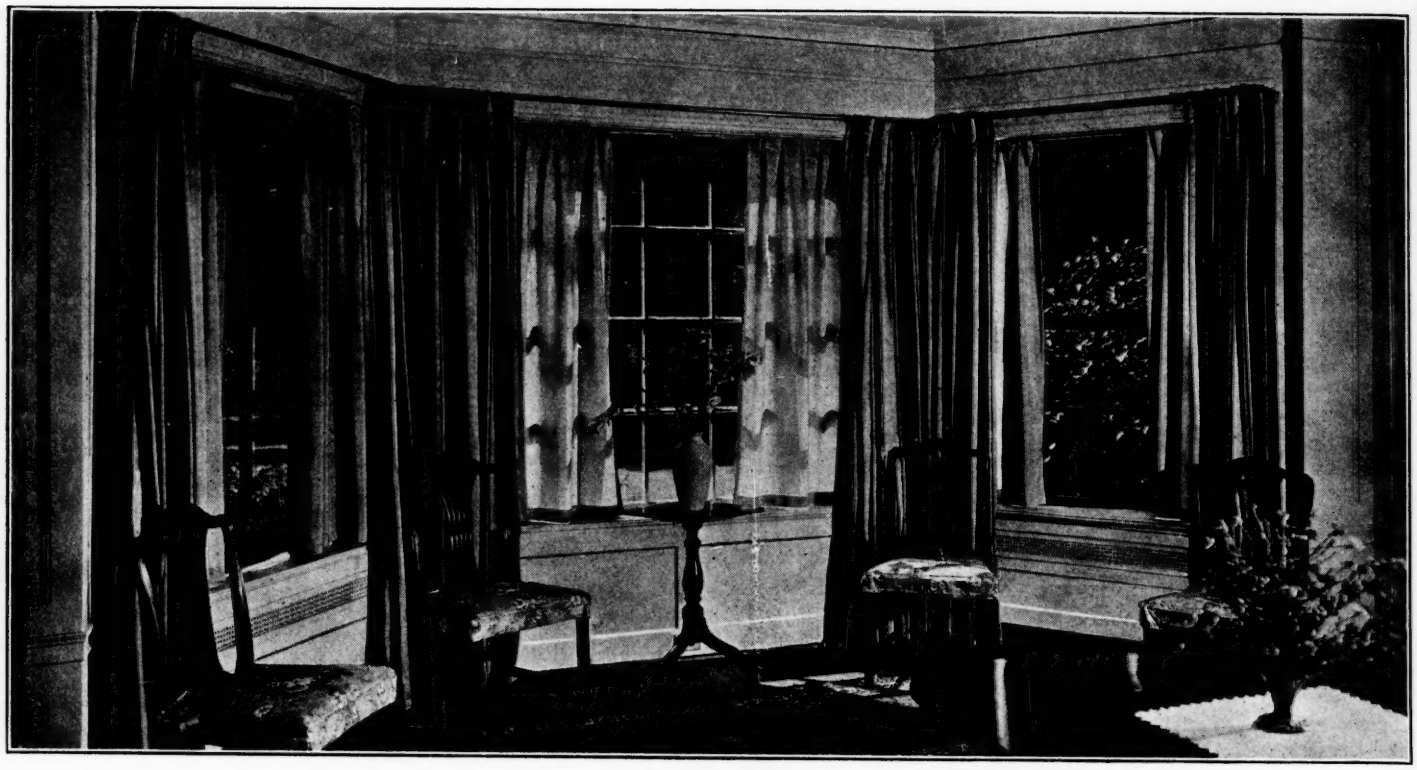

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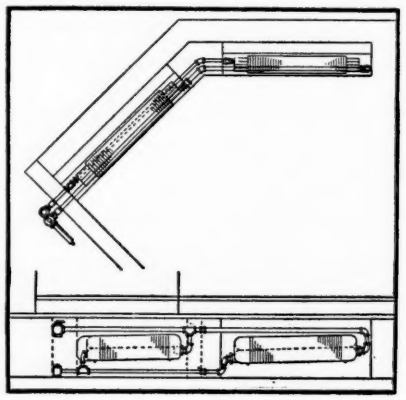

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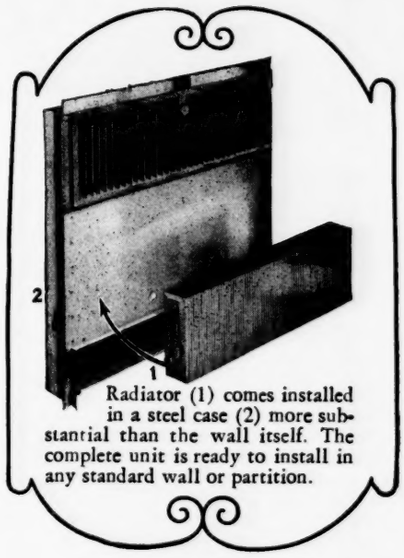

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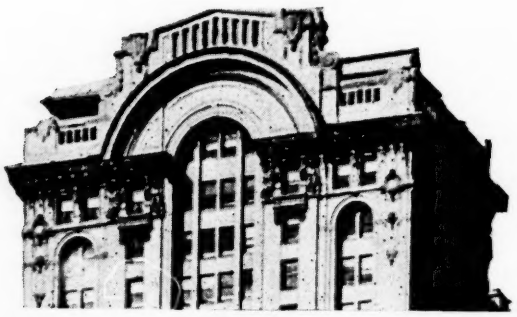

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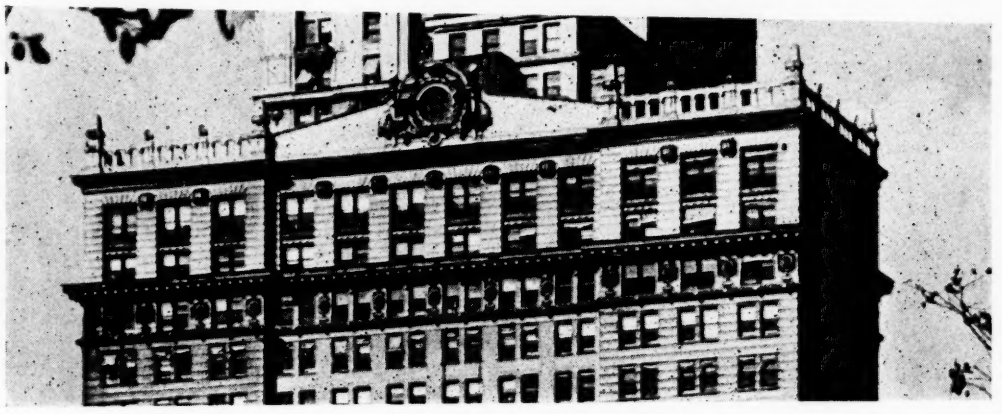

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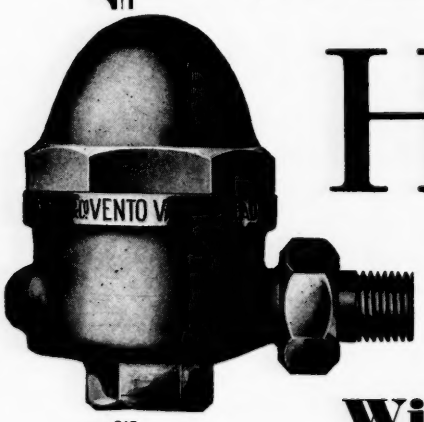

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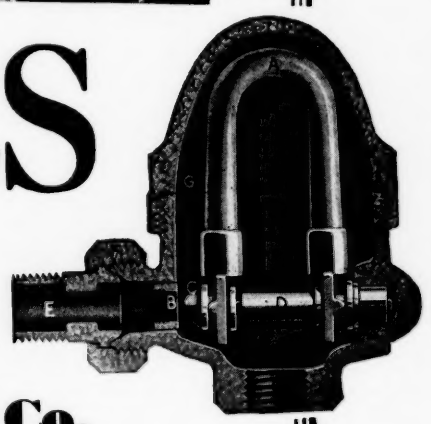

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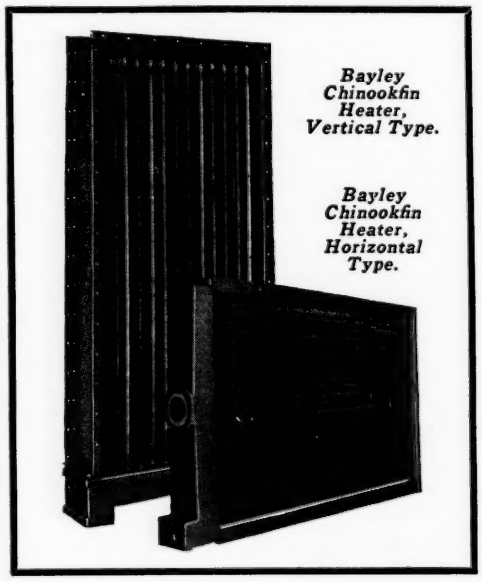

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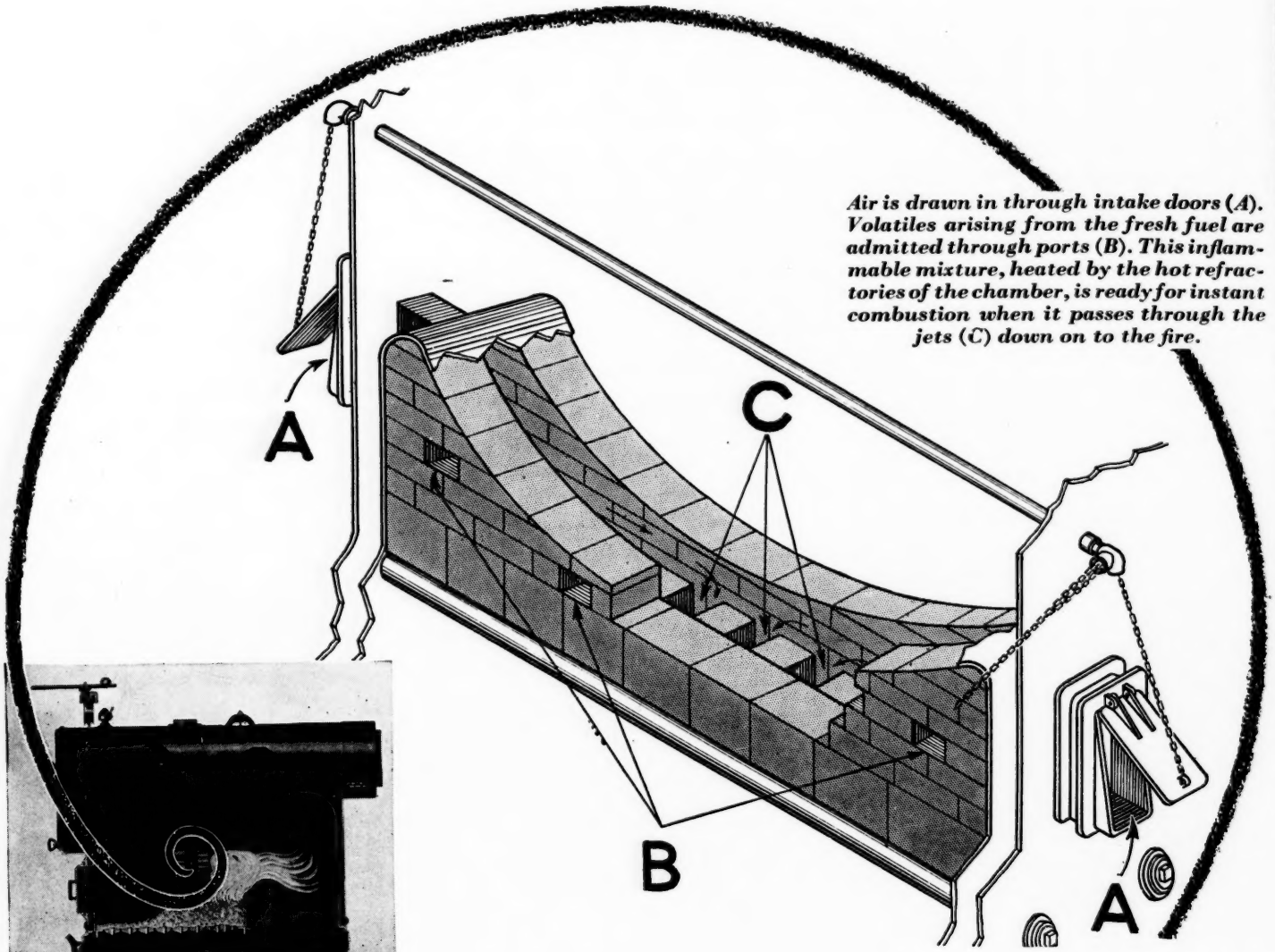
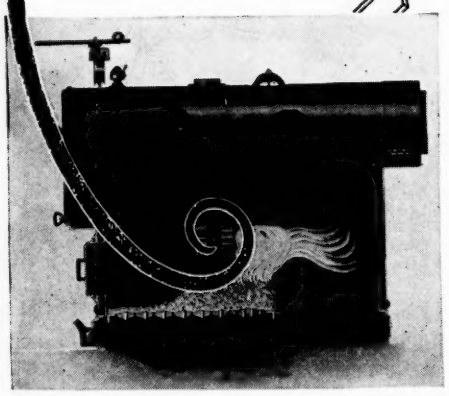


Air is drawn in through intake doors (A). Volatiles arising from the fresh fuel are admitted through ports (B). This inflammable mixture, heated by the hot refractories of the chamber, is ready for instant combustion when it passes through the jets (C) down on to the fire.



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VOL. 27 **NO. 1**

Credit

IN a recent partisan discussion the question was raised as to how much of the industry's advance in recent years is to be credited to the industry itself and how much to outsiders, whose ideas led them to enter the heating field. In the final analysis, the score stood about like this:

	Developed within the Industry	Developed from the Outside
Air washers	1	–
Air filters, dry	–	1
Building insulation	–	1
Concealed radiators	1	–
Floor ventilators	–	1
Gas heaters	–	1
Metal weatherstrips	–	1
Non-ferrous heating surface	1	–
Oil burners	–	1
Unit air conditioners	1	–
Unit heaters	–	1
Unit ventilators	–	1
Vapor heating systems	1	–
Zone heating systems	1	–
	6	8

So the glory is pretty evenly divided, after all.

A. S. Armagnac

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A. S. Armagnac, Editor; Clifford Strock, Associate Editor; Cliff W. Presdee, Advertising Manager; Gustave Petersen, Special Representative; William F. Steeg, Western Manager; European Representative, W. G. Hollinworth, Somerleyton Road, Oulton, Lowestoft, England.

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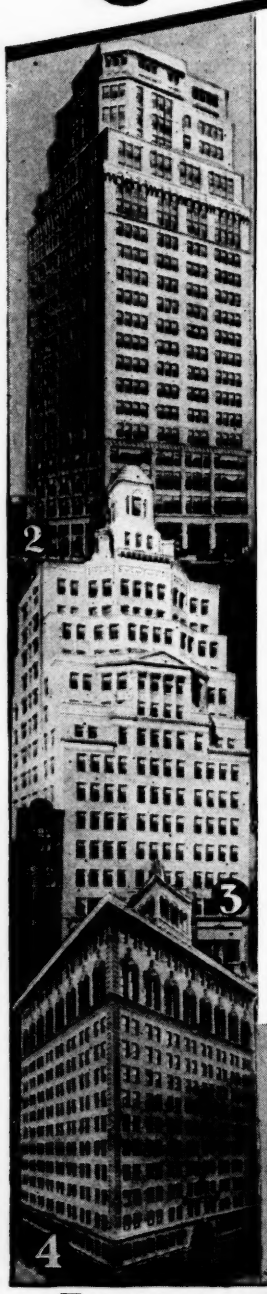

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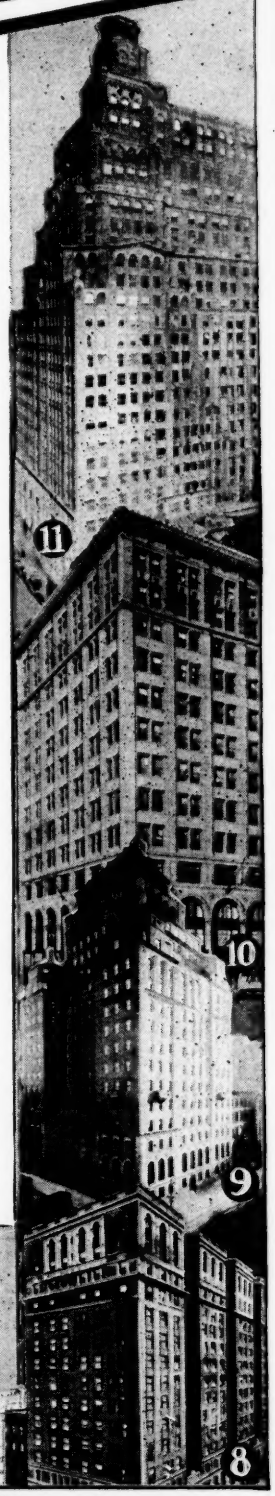


Radiator Traps, Inlet Valves and Temperature Regulators

HEATING AND VENTILATING

Editorial

NOW that "certified heating" has proved its worth in new building construction, the question is being raised in more than one quarter as to whether it can be applied with equal success to existing buildings. The anthracite coal interests, for example, are beginning to see in "certified heat" a means of insuring the adequacy of heating plants burning hard coal. They feel very naturally that once such a plant is brought up to standard, from an efficiency standpoint, many of the complaints they are receiving on that score from building owners would cease. What is even more important, such a plan, they feel, would go far toward breaking down the competition of other fuels, especially when "sick" coal-burning heating plants are in question.

At last month's meeting of the Anthracite Club, of New York, the matter came up for serious discussion and a movement was inaugurated to have the club cooperate with the H. & P. C. New York City Association, to see if a plan could be formulated for certifying heating plants in existing buildings. This may not be the best mode of procedure. In fact, judging from a preliminary discussion by the conferees, it seems more than probable that the scheme can best be handled through the New York Heating Board of Trade, which is in process of formation.

While the move has our hearty support, we should not limit it to anthracite coal-burning plants, but would apply it to every type of heating installation, including those burning oil and gas. With the operating machinery in the hands of such an organization as the New York Heating Board of Trade, an extension of the plan to include other fuels would be easy to carry out in the metropolitan district. Obviously, if the plan met with any degree of success, its extension throughout the country would follow, very much as the success of the local heating board of trade will lead to the enlargement of its sphere of activity.

STATISTICS usually are dry but there is something almost sensational in the figures issued by the Bureau of the Census, dealing with the shipments of gas-fired boilers during recent months. From a total of $263,000 in April, 1929, and $190,000 in May, 1929, as reported by eight manufacturers, representing 75% of the industry, the figures have mounted steadily in subsequent months, being $285,000 in June, $315,500 in July, and $486,500 in August. The cumulative totals, from January 1 through August 31, are $1,513,000 for 1928, and $2,025,700 for 1929, a clean gain of 33.9%.

Equally interesting are the government figures on the shipments of domestic oil burners. During 1929, the shipments of 50 companies doing approximately 60% of the business, expressed in the number of units shipped, were 2413 in January, 2407 in February, 3365 in March, 2940 in April, 3746 in May, 4189 in June, 5405 in July, 9343 in August, 12,207 in September and 13,761 in October, or a total of 59,776 for the first ten months. On that basis, the total shipments for the entire industry for 1929 may be estimated at 124,000, which would be an increase over last year's output.

Finally, a survey of sixteen of the leading manufacturers of domestic stokers discloses the fact that the sales for the first eleven months of 1929 are 186% ahead of the previous year's total.

In the face of such a record, our prediction of a "hoss race" in the domestic fuel field seems likely to be fulfilled sooner than any one expected.

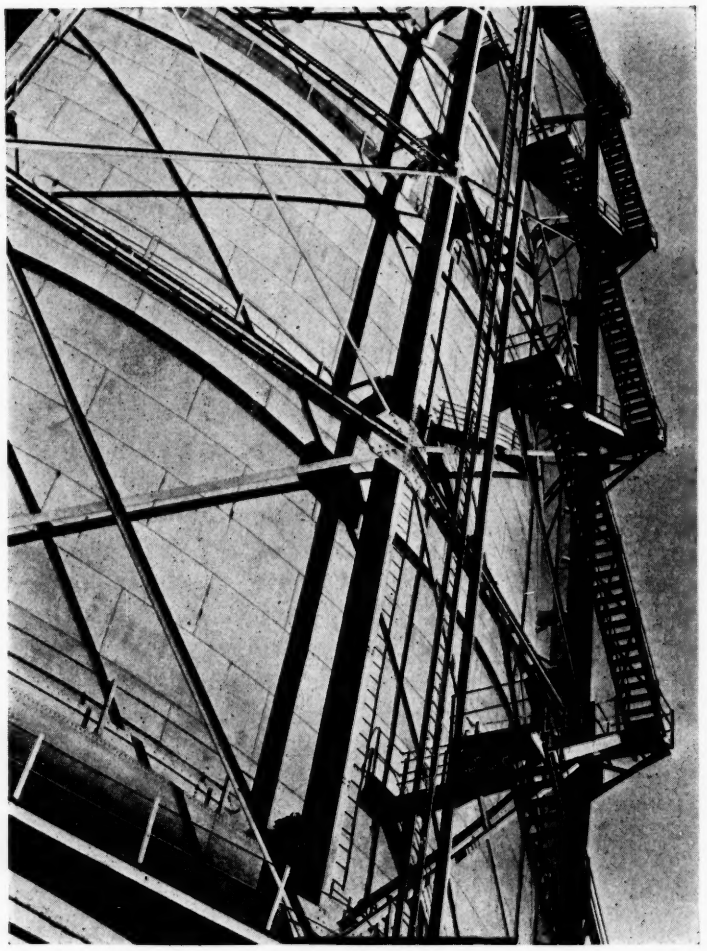
BY the time these words are in print, plans will practically have been completed for the first International Heating and Ventilating Exposition in Philadelphia, to be held the last week in January, simultaneously with the annual meeting of the A.S.H.V.E. To say that the exposition will exceed the expectations of its most ardent supporters is not stating the case too strongly. More than 200 exhibitors already have engaged space for the display of their products and when it is realized that these exhibits will all be confined to the field of heating and ventilation, it is evident that the exposition will be an imposing demonstration of the size and importance of this thriving industry. More than that, it is safe to say that the attendance will run well up into the thousands and will include not only architects, engineers and contractors, but an army of professional and lay people, health board officials, hygienists, scientists, home owners and building owners who have yet to appreciate fully how far the art of heating and ventilation has advanced. The dates are January 27-31.

Within a few days, every subscriber of HEATING AND VENTILATING will receive his copy of our International Heating and Ventilating Exposition Supplement. It will bring you, among other things, full details of the exposition, as well as the program for the sessions of the A.S.H.V.E. The Supplement will reach you in time to convince you beyond any wavering doubt that this is one occasion you must not miss.

House-Heating by Gas

by **C. GEORGE SEGELER**
Industrial Editor, American Gas Association

Markets for gas heating, rates, types and properties of various gases, and cooperation between the utilities and contractors are discussed in this introductory article on gas heating by an authority on the subject. Succeeding articles in this series will cover the combustion of gas, flue gas losses, piping, gas conversions, gas consumption and other technical phases of automatic heating with gas.



"Going Up"
Photograph by Anton Bruehl

WITHIN the course of a very few years, public acceptance of gas for house-heating has grown to such an extent that every one engaged in the heating trades is interested in the prospects of this business. While gas for house-heating is not a new thing, the market for gas house-heating has not been scratched as yet.

There is no need to repeat what has been gone over so many times on these pages; to explain that gas house-heating is often more expensive than coal heating; to go over in detail the intangible advantages of gas which should offset this price difference. Gas house-heating has passed that stage. Today it has an established place in the heating trade, and its points of superiority are well recognized and understood.

With the introduction of special rates for gas burned in house-heating equipment, the number of home owners who can be sold on this form of heating has been vastly increased. While such figures are arbitrary, it can be said that, in general, the home owners whose incomes are $5000 a year or more are prospects for automatic heat.

To make this statement specific, consider the actual situation in a given locality. In Chicago, for example, the Real Estate Board and the Own-Your-Own-Home Association report that there now are almost 180,000 home owners and that this number is increasing at the rate of 500 per month. A large portion of these are in the suburbs and it is estimated that at least 60% of them have incomes of $5000 per year or more. If this situation is indicative of the other large cities of the United States, then a national survey of the possibilities of gas for house-heating certainly will show an enormous unsold market that will be exploited in the next few years.

The market for gas house-heating has not been scratched, and it never will be if gas is to be sold on a basis of dollars-and-cents comparisons; on the basis of showing customers comparative cost tables; on the basis that gas is just another way of heating the house, factory or office.

Markets for gas house-heating are not confined to private homes. A survey of any city will show many buildings such as banks, clubs, churches, office buildings, etc., in which basement space is at a premium. In a bank, for example, the basement space now occupied by coal storage and coal equipment might be converted into a "valuables" storage room, or additional safe deposit boxes, the rental of which would be considerably more than the difference in cost between gas and coal heating. Clubs will desire additional room for bowling alleys or billiard tables or meeting rooms, and the gas boiler provides the means. A church, on the other hand, will require heat intermittently, and may not have adequate janitor service which will enable them to fire a non-automatic heating plant. These special groups could be elaborated upon in some detail, but it seems sufficient in this article to point out the possibilities, rather than to attempt to cover them completely.

Before entering into a detailed discussion of gas house-heating, it is necessary to separate mentally the territory served with manufactured gas from the territory served by natural gas. Manufactured gas in the various parts of the United States is made from coal and oil, by the following processes:

1. Coal gas. By the application of heat to retorts containing bituminous coal, thus, by the process of destructive distillation, breaking down the coal into a group of permanent gases called coal gas, a liquid mixture of coal tar and ammonia, and a residue, coke.

2. Coke oven gas. Essentially the same process as (1), with the difference in temperature of operation and design of retort chambers, resulting in different proportions of the various products.

3. Carburetted water gas. By applying steam to incandescent carbon to either coal or coke, reacting to form carbon monoxide and hydrogen. The mixture being too low in heat value, is enriched with oil vapor. The cooling action of the steam on the red hot fuel is subsequently balanced by admitting air to re-ignite the carbon during the "blow," the products of which are diverted to the stack.

4. Oil gas. Principally manufactured on the Pacific Coast, using oil in place of coal or coke in a process otherwise essentially the same as (3).

5. Other processes include distillation and fractionation of natural fuel oils; carbonization at low temperatures in continuous retorts, and various combinations of the previously described methods.

Manufactured gas has a heating value which ranges from a low of 450 B.T.U. per cu. ft. served in Spokane, to a high of 600 B.T.U. served at Cedar Rapids. In spite of this rather wide limit, the great majority of gas companies serve gas between 525 and 550 B.T.U. per cu. ft.

State Commissions Control Properties of Gas

The B.T.U. value is controlled by regulations imposed by the various state public utility commissions. In each locality the value is fixed by the commission at the level which will enable the company to produce gas of such heat value that it can be served economically to the customers. The local gas pressure and specific gravity, as well as other criteria of gas quality, are also under strict supervision by the utility commissions. Engineers of the various commissions make tests of the gas for quality, pressure, and heat value at frequent intervals.

Specific gravity of manufactured gas varies from 40% to 70% of that of air, depending upon the gas composition. The pressure of gas is measured in inches of water column, the usual values being between 3.5 and 6 in.

Manufactured gas from whatever source is sold under various rate schedules provided by the public utility commissions, but the average price to the customer for house-heating gas will be found between $.50 and $1.00 per thousand cubic feet.

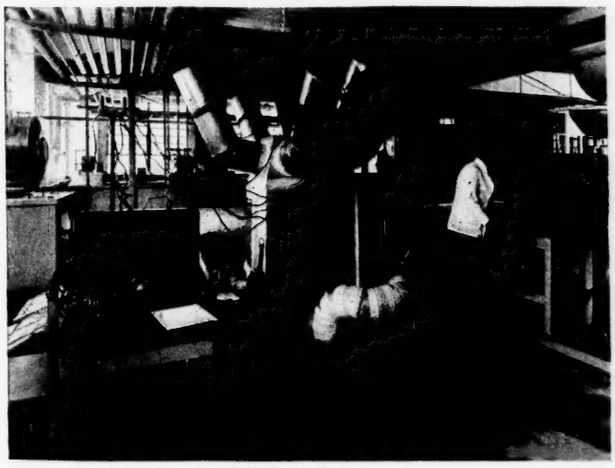
Natural gas, on the other hand, is derived from wells usually located at some distance from the distribution centers, so that long transmission pipe lines are not at all unusual. Natural gas, for example, is served in Denver, Colorado, after having been piped some 340 miles from Amarillo, Tex. Natural gas is an ideal fuel from every viewpoint.

The heat value of natural gas is between 900 and 1200 B.T.U. per cu. ft., depending upon its composition, the average being around 1000 B.T.U. per cu. ft. It has a decidedly lower cost of production than manufactured gas, and can therefore be sold at very much lower prices. Depending upon how close the market is to the field, it is possible to secure natural gas between $.35 and $1.00 per thousand cubic feet, but it must be borne in mind that one is buying about twice as much energy in 1000 cu. ft. as could be purchased in manufactured gas.

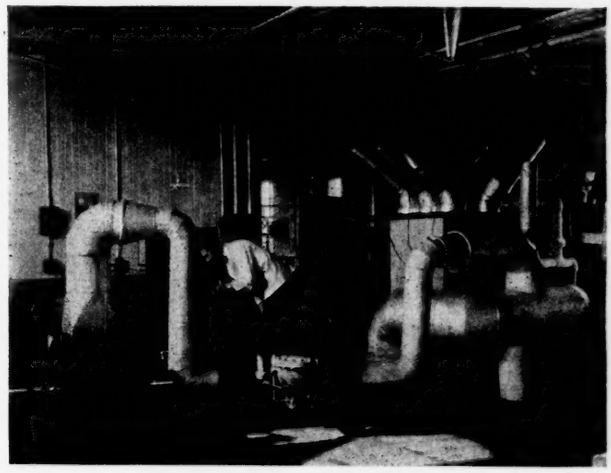
Natural gas is available in a widespread territory including the States of Arkansas, California, parts of Colorado, Illinois and Indiana, in practically all of Kansas, West Virginia, Ohio, Oklahoma and Texas, and it is widely available throughout Kentucky, Louisiana, Maryland, New York and Pennsylvania, as well as in some localities in other states.

Manufactured gas is available in practically every city over 10,000 population not served by natural gas, and in many hundreds of smaller communities as well.

From the difference in heat value and rate, it can be seen that where natural gas is available, gas for



Engineering of a High Order is Involved in Testing Gas Furnaces at the A. G. A. Testing Laboratory, Cleveland



Thomas Meter for Measuring Low Air Velocities in Furnaces at Testing Laboratory

house-heating is going to attract a much wider group of prospects because of its relatively low cost. There are many towns in the natural gas territory where almost every house owner uses natural gas for heating, particularly in towns located at some distance from sources of coal suitable for house-heating, as for example, in Texas, Oklahoma, and Kansas, where it will be found that natural gas is used almost exclusively.

While some mention has been made of the rates for gas in the preceding section, the heating engineer will be interested in knowing something about the details of rate forms. In the early days, gas was sold at so much per thousand cubic feet, but it was soon found that all customers were not being served at equal costs, and new forms of rates were devised to recognize the difference in customer costs. These rates are known to the gas engineer as "part" rates, because they contain several clauses involving a fixed charge for the commodity, gas, itself, and another charge which is to take care of the variation in hourly or daily demand for gas on the part of the customer. For house-heating purposes, these rates take various forms. Some of them are based on a charge for the amount of equivalent cast-iron steam radiation installed in a house. An example of this is the following rate:

> Rate for House Heating Customers only—
>
> 24c per square foot for the first 1000 square feet of equivalent cast-iron steam radiation, payable in eight equal monthly installments beginning with the October bill.
>
> Plus 75c per thousand cubic feet of gas burned.

Another form of house-heating rate has a demand charge of 35c per cubic foot of maximum hourly demand for gas, and a commodity charge of 50c per thousand cubic feet of gas burned. A house with 500 sq. ft. of radiation installed would have a boiler of 780 sq. ft. of boiler capacity installed, and would burn approximately 442 cu. ft. of gas per hr. There would therefore be a demand charge of $154.70, payable in equal installments over a year's time, and in addition the commodity charge would have to be paid. A building of this size in an average climate might burn 500,000 cu. ft. of gas for the winter, which would mean that the commodity cost would be $250 and the total gas bill, $404.70. This is equivalent to an average rate of about 80c per thousand cubic feet.

Headquarters in Chicago of the United Association of Journeymen Plumbers and Steamfitters of the United States and Canada Is Heated by Gas

Still other towns sell gas at flat rates of so much per thousand cubic feet. Some rates become cheaper as the quantity used per month rises, while others, especially in the natural gas districts, may have a rate that rises with increasing consumption. In any event there has been a marked decline in the cost of gas for house-heating during the past few years, with every indication that this trend will continue.

Testing Laboratory Serves Public and Gas Industry

Cooperative efforts on the part of the gas companies and manufacturers during the early part of 1925, resulted in founding the A.G.A. Testing Laboratory at Cleveland, O. The laboratory was located there because both natural and manufactured gas are available, and because Cleveland is centrally located for shipping.

The Testing Laboratory was established to serve the entire gas industry. Any manufacturer, or other interested party, by payment of the regular test fees, may avail himself of its services. Non-members of the association are charged fees higher than those paid by members.

All appliances are tested on both manufactured and natural gas in accordance with approval requirements laid down by a national committee consisting of representatives from the U. S. Bureau of Mines, U. S. Bureau of Standards, U. S. Public Health Service, National Association of Master Plumbers, gas companies and manufacturers of appliances.

The standards required for compliance with the Approval Requirements provide that the gas appliances will satisfactorily meet local conditions experienced all over the United States, no matter what type of gas is used. Approved appliances must possess not only the ability to meet variations in gas quality, but marked fluctuations in gas pressure as well. This policy has been regarded as a great contributor to the future success of gas appliances, because no particular locality can be certain that there will be no change in the gas supplied over an indefinite period.

Thermal efficiency of steam and hot water boilers must be at least 75%, and of furnaces at least 70%. All approved equipment which has been tested so far has exceeded these minimum values. The list published monthly by the laboratory designating the approved equipment shows output ratings for steam and hot water boilers based on a thermal efficiency of 80%, and a heat emission factor of 240 B.T.U. per sq. ft. for steam and 150 B.T.U. for hot water systems. No output ratings are published for warm-air furnaces, input only being listed.

When an appliance has successfully complied with the requirements of the laboratory, a certificate is issued by the director permitting the manufacturer to display the Laboratory Seal of Approval. The Seal indicates that the appliance complies with basic national standards of safety. In other words, a gas appliance that cannot pass the laboratory tests is not fit to be used, and every practical means should be employed to prevent the sale of it. This program has been actively supported by all of the gas companies of the country, who have pledged themselves not to sell appliances that have not passed the laboratory tests.

An exception to this rule includes such appliances for which no testing code has yet been developed. This is true, for example, of burners used for converting coal boilers or furnaces to gas burning. In a subsequent article it is hoped to go into detail into the subject of conversions.

It may be briefly mentioned here, however, that no approval requirements have been drawn up for conversion burners because it is more the method of installation than the original design of such equipment which would render it satisfactory or unsatisfactory to the customer.

The American Gas Association has appropriated a substantial amount for research into the subject of house cooling. The November issue of HEATING AND VENTILATING contained an interesting article on space cooling by means of ice for small offices. The object of the A.G.A. research is along the small house and small office lines. It is hoped that it will be possible to devise a single unit which will combine the heating system for the winter time with the cooling apparatus for the summer time, to be built in small sizes and at prices within the reach of the home owner.

While this is only part of the research program having direct application to the heating trade, the other activities which have been undertaken include research in new methods for gas manufacture which would, if successful, result ultimately in the production of gases of much lower cost than at the present time, and thus make it possible for an even wider increase in the use of gas for house-heating.

It has been pointed out that the heating trade had a splendid merchandising, as well as installation, opportunity at hand in the form of gas equipment. Naturally, it is a matter of interest to know the attitude of the utility company toward the trades in this business where the two groups will naturally be in competition. A recent issue of HEATING AND VENTILATING published the agreement between the Heating and Piping Contractors National Association and the American Gas Association in reference to this point.

The general policy of gas companies is to encourage heating contractors, appliance manufacturers, and other agencies as much as possible in the sale of approved gas equipment. In many cases the gas company will act as jobber for a particular make of equipment, giving the heating contractor a discount on all appliances which he sells.

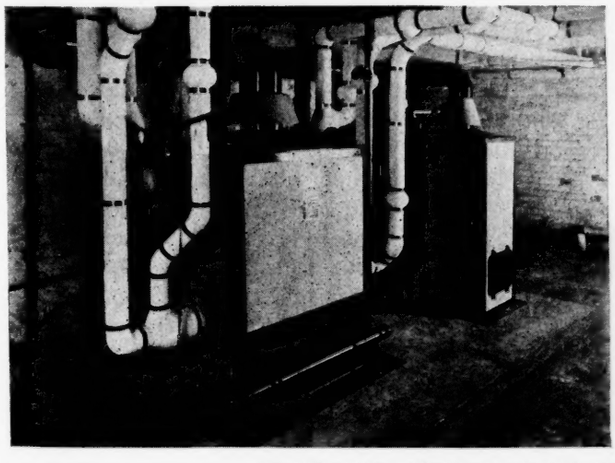
However, the heating trade naturally cannot take the same interest in the sale of gas appliances as the gas companies do, and therefore most gas companies also engage in the merchandising of at least part of the gas appliances sold in each community.

No matter what the method of merchandising, the gas company almost always tries to maintain the standards for the installation on a high plane. This is a vital necessity for the utility company, because any complaint which arises in reference to gas invariably falls upon the utility company, while in the case of coal or oil-burning appliances, it is usual to send complaints to the heating contractor who made the installation. This point alone shows why the gas companies insist upon maintaining at least supervision over all gas house-heating.

Gas companies will check any proposed gas installation without cost, and will assist the heating contractor in many different ways. Some companies will send out gas company salesmen with the heating contractor on request, to assist in closing the sale, and still allow the heating contractor full discount on any appliances which he may sell. Of course, the details of local practice will vary from town to town.

On new buildings, almost every gas company deals through the heating contractor, the gas company only delivering the boiler or furnace to the customer, while the heating contractor makes the sale, but no matter how the sale is made, there are very few gas companies who do their own installation work. It is customary to let the installation to reliable heating contractors, either in accordance with a previously submitted bid, or on a time and material basis. A further form of cooperation is the extra discount allowed on equipment which is to be displayed in the shop of the heating contractor, or to be used in his own home.

Servicing of gas appliances is usually taken care of by the gas company. It is the general practice for companies to inspect all house-heating appliances at least once a year, and in many cases more often. At the time of this inspection, the gas company cleans the burners, brushes down the sections, tests the various controls, and submits a complete service report indicating that the heater has been left in satisfactory operating condition. This service is given without charge to the customer, and it provides excellent insurance that gas appliances will have many years of uninterrupted usefulness. Moreover, the gas companies maintain a day and night emergency service so that the customer can be served quickly in case an emergency should arise.



Gas-Fired Installation in the W. H. Taylor Longacre Estate, Bayside, L. I.

The Old and the New in Air Conditioning

R. H. Macy's—the Largest Air-Conditioned Store in the World

MANY interesting sidelights on the progress of air conditioning during the past quarter century were given by Werner Nygren, consulting engineer, of New York, in an address at the December meeting of the New York Chapter, held December 16, at the Building Trades Club, New York. Mr. Nygren's experience in this field dates back to one of the early air-conditioning installations, which was that which he designed under the late Alfred R. Wolff, for the New York Stock Exchange. He commented at length upon this installation and then contrasted it with the one recently completed in the store of R. H. Macy & Co., New York.

Previous to Mr. Nygren's talk, the meeting was addressed by President Thornton Lewis, who told of the society's achievements and pleaded for support in the society's campaign to increase its membership.

Mr. Nygren spoke for over an hour and held the close attention of his hearers throughout his address. Over 100 members and guests were present. In introducing the subject, he said:

"The development and advancement of air conditioning is another indication pointing to the fact that nothing can block progress, not even an inordinate cost of producing results.

"I have grown up with and have seen this science develop from the time it was only applied for manufacturing processes and, if you will bear with me, I will draw a comparison showing the essential difference between those days and now. We have, in these days, ready-made appliances of various makes covering the entire field for producing refrigerating effect, cooling and dehumidifying of air, and for control of both temperature and humidity.

"This is the most essential difference between the present time and the time when air cooling was first attempted. It is not, however, the only difference. The layman's attitude toward the science also has changed, making it a lot easier for the engineer.

"Formerly, and not so long ago, when the possibilities in this direction were first recognized, there were many wild and conflicting ideas on the subject. Many of you perhaps will recall articles in scientific journals, as well as in the daily press, making statements of this kind. Some maintained that it was just as easy and just as cheap to cool a room in summer as it was to heat it in winter. Others maintained that air cooling was insanitary and unhealthy for the human system.

"The former, or those that thought that air cooling was within reach of all, sometimes went so far as to suggest the circulation of brine through the heating system in the summer time, and those who thought air cooling unhealthy claimed that artificially cooled air could not help being wet, clammy and unpleasant.

"The engineer, in each case, was thrown on his own resources in designing a cooling and dehumidifying equipment and, due to lack of experience and data and lack of parallel cases to learn from, there were many failures.

"In some cases operating engineers without sufficient knowledge of physical laws attempted installations without making any allowance in the capacity of the refrigerating machines for the moisture which had to be extracted, with the result that no

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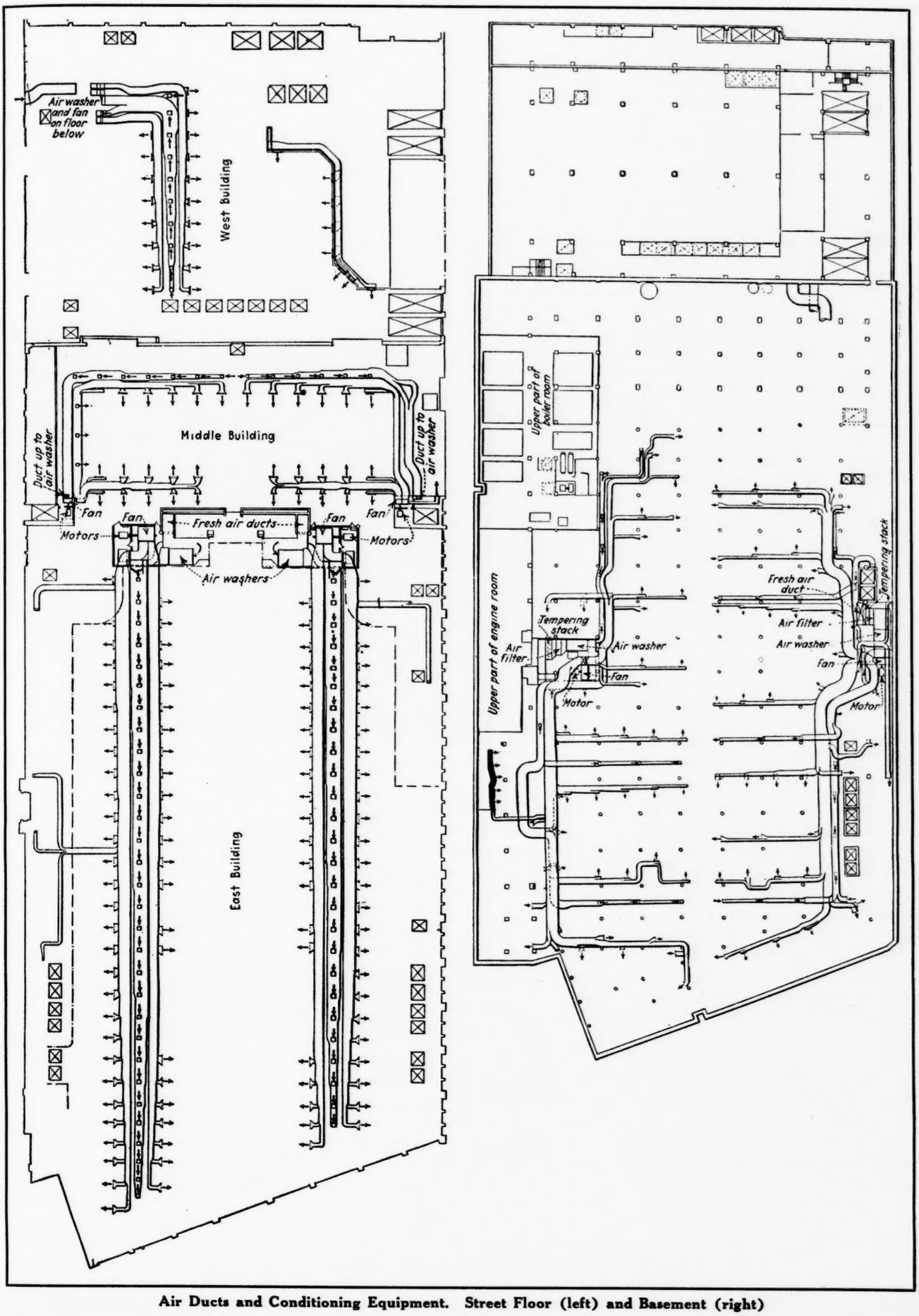


Air Ducts and Conditioning Equipment. Street Floor (left) and Basement (right)

appreciable cooling effect was produced. In other cases, cooling coils were installed in connection with existing ventilating systems not at all suitable for handling air below room temperature, with the result that drafts were produced which made the cooling a failure.

"While these experiences were usually on a small scale, nevertheless, they were voiced about, making it very difficult to convince any client that cooling of air on a large scale could be made successful."

New York Stock Exchange

Taking up the installation for cooling the New York Stock Exchange, Mr. Nygren recalled the fact that this installation was made in the summer of 1902. The contract, exclusive of ventilating fans and duct work, amounted to $123,000, which he characterized as "pre-war money." He made the comment that this price compared with a price of $487,000 for the Macy equipment, including all ventilating fans and duct work, as well as the refrigerating machine, air washers and other appliances, plus several thousand dollars for work done on overtime and about $200,000 for structural work, cutting and patching.

Mr. Nygren paid a well-merited tribute to the late George B. Post, architect of the New York Stock Exchange, who prevailed upon the building committee to adopt the design which, he said, stands as a monument to the late Alfred R. Wolff.

At that time, Mr. Nygren was one of Mr. Wolff's assistants, and it was his good fortune to be selected, as he expressed it, "to push the pencil" in the preparation of the layout, make the calculations for it and also supervise the work of installation. Mr. Nygren brought down the house when he repeated one of the arguments which Mr. Post used with the building committee to the effect that, "When it is possible to freeze dead hogs in Chicago stockyards, it must be possible to cool live bulls and bears in the New York Stock Exchange."

"It was one red letter day in Mr. Wolff's office," he said, "when the contract for this work was awarded and another red letter day when the plant was put in operation, as it proved that it could do all that was claimed for it and a little more."

Two features, Mr. Nygren said, gave him particular concern; the first was the possibility of ice forming on the bunker coils, due to the low temperature brine, which had to be used in order to keep down the size of these coils; second, the possibility of drafts from the cool air.

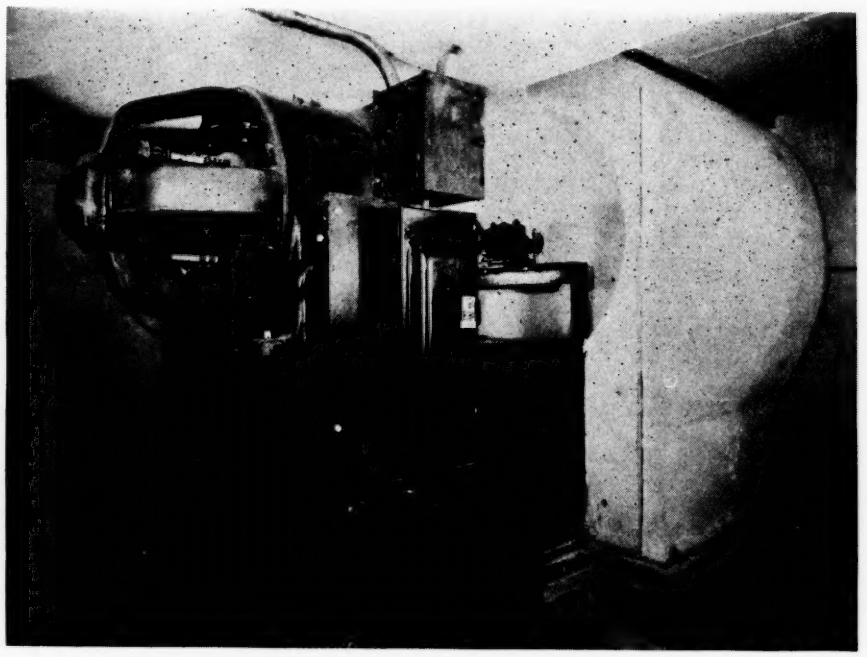
"The original cooling system in the New York Stock Exchange," continued Mr. Nygren, "was to serve the board room on the ground floor, the Western Union and Postal Telegraph offices in the basement, and the safe deposit vault in the second basement. The total population figured on for these departments aggregated 1200.

"No means for recirculation was provided, principally because space conditions did not permit this arrangement. Instead, the air supply to the cooled rooms was reduced to about one-half of that available for winter operation. At least our calculations were made on this basis and if my memory serves me right, it worked out satisfactorily.

"In other words, all the air supplied for ventilation to the cooled rooms was passed through bunker coils, thence through tempering stacks (used, of course, only in cool weather) in its transit to the fans, of which fans there were two, one for the board room and the other for the basement rooms.

"These fans were equipped with variable-speed motors that could be run at any desired speed, ranging from one-half to full speed. This was done so as to be able to reduce the air supply during cooling conditions in accordance with the requirements.

"The bunker coils installed at the time were made up of about 20,000 lin. ft. of 1¼-in. galvanized pipe, each section welded together and bent into trombone shape through which the brine was passed in an opposite direction to the air flow.



One of the Fans Distributing Air to Basement Floor

"The bunker coils were divided into two sets, originally with the intention of using one set at a time so as to be able to melt off the ice on one set while the other was in use.

"In practice, and by carrying a slightly higher brine temperature than originally intended, it was found that only a thin coating of frosting was formed on the outside coil when the two sets were used together, so henceforth this method was used, and, for all I know, it is still being used. Thus our greatest bugaboo problem sort of solved itself and in a very simple and satisfactory manner.

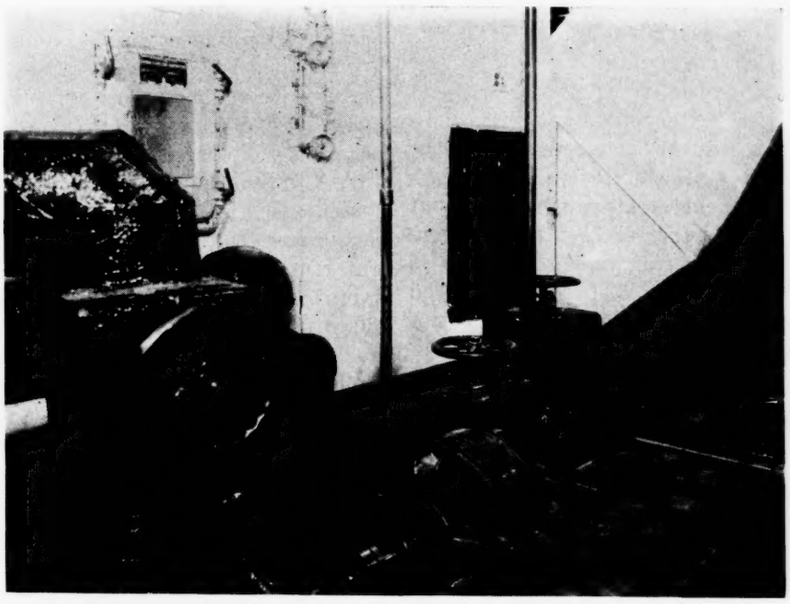
"The refrigerating machine installed for this cooling system was a Carbondale absorption machine in three equal-size units, each so designed that it could be operated either with exhaust steam from the dynamo plant or with medium-pres-

sure steam composed partly of exhaust steam from the ammonia and brine pumps and partly live steam reduced to about 30 lbs. pressure.

"By this arrangement it was possible to operate with exhaust steam in ordinary weather or increase the output of the machine of one, two or all three units when this was necessary in order to meet the more severe weather conditions.

"The capacity of each refrigerating unit was equal to 100 tons refrigerating effect with exhaust steam and 150 tons with a steam pressure of 30 lbs. per sq. in.

"The boiler pressure carried at the time was about 100 lbs., and since the ammonia and brine pumps were designed for especially high back-pressure, this arrangement was possible."



Cold Water Pump for Washer Spray Nozzles and Basement Air Washer

When the new addition was built to the Stock Exchange, it was necessary to provide a much greater refrigerating capacity. At that time, the absorption machine was removed and replaced with a motor-driven compression plant. Mr. Nygren had nothing to do with this change but he pointed out, however, that it did not alter the original method of cooling air by bunker coils through which brine is circulated. This method is still used, and in the speaker's opinion, was as good as any other method, where the bunker coils can be accommodated in the available space.

Referring to the much-feared drafts from the cool air Mr. Nygren stated that "in the board room, air is distributed at the ceiling about 80 ft. above the floor and the question which confronted us in the design was whether air heavier than the room temperature would descend in streaks or be diffused in transit." From his observations, he stated, "the air either became diffused or the descending air absorbed sufficient heat from the air through which it passed to prevent drafts that could be felt." At any rate, with but a few adjustments, satisfactory results were obtained, although he stated frankly that he never did know exactly whether the air was diffused or absorbed heat from the room.

R. H. Macy Plant

Turning to the R. H. Macy Store, Mr. Nygren stated, that in the case of the air-conditioning equipment of this building, the problems were somewhat different and he emphasized the fact that the origin of the idea came from within instead of from any outside source.

"In other words," he stated, "it was demanded by the owners and had been under consideration for the past six years. Lack of space for the refrigerating machine and the staggering amounts of the estimates submitted, delayed the project. At intervals, in the meantime, the question of air cooling was brought up, until in June, 1928, a request was made to prepare an estimate for cooling the first floor of the middle building. Upon investigation, it was found possible to obtain the required refrigerating effect for this air cooling by loading up the existing ammonia refrigerating machine, serving kitchen, restaurants, etc., to its capacity, but this scheme did not go through. To tell the story in Mr. Nygren's words:

"Instead, I was authorized to prepare a complete prospectus on what could and should not be done if a certain space in the sub-basement (then utilized for packing room) was given up for a refrigerating machine of sufficient capacity to cool the entire ground floor and sales basement.

"On August 21, 1928, I submitted a new report along these lines, together with an estimate of the probable cost, and, on the strength of this report and despite the enormous cost involved, we were authorized to proceed with the preparation of drawings and specifications for a complete air-conditioning equipment for the main floor and the basement. Early in February of this year, the contract was let and the work of installation started.

"In designing this equipment there were many and difficult problems to contend with. In the first place, the existing duct systems for ventilating the first floor and basement could not be utilized for distributing or returning air with the new system. In the next place, it was very difficult to find space for the cooling units and I cannot remember how many compromises were made with the owners and Robert D. Kohn, the architect, before these units were finally located. Moreover, the building being already built and occupied, the work had to be so arranged that the installation would not interfere with the transaction of Macy's business. In addition thereto, all ducts and flues had to be concealed and placed in a manner which would not mar the appearance of ceilings and walls.

"Because of these conditions, there is no uniformity in the arrangement of the cooling units, of which there are seven, each consisting of an air filter, a tempering stack, an air washer and a fan with direct-connected motor drive.

"Two of these units are for and located in the basement, the space

for the same being given up by sales departments. These two cooling units come nearer being of standard arrangement than any of the other five.

"There are two cooling units for the first floor of the original building, known as the East Building. These cooling units have the fans and the air washers on the first-story balcony and the tempering stacks and the air filters on the second story balcony on the 35th Street side of the building.

"There are two cooling units for the first floor of the Middle Building. The fans for these cooling units are set on the first floor, the air washers on the second floor, and the air filters and tempering stacks on the tenth floor.

"There is but one cooling unit for the first floor of the new nineteen-story building, known as the West Building. This cooling unit is located on a gallery built over the basement shipping room, having the air filter, the tempering stack, the air washer and the fan, all on one level, but arranged in a very peculiar manner in order to get it into the space.

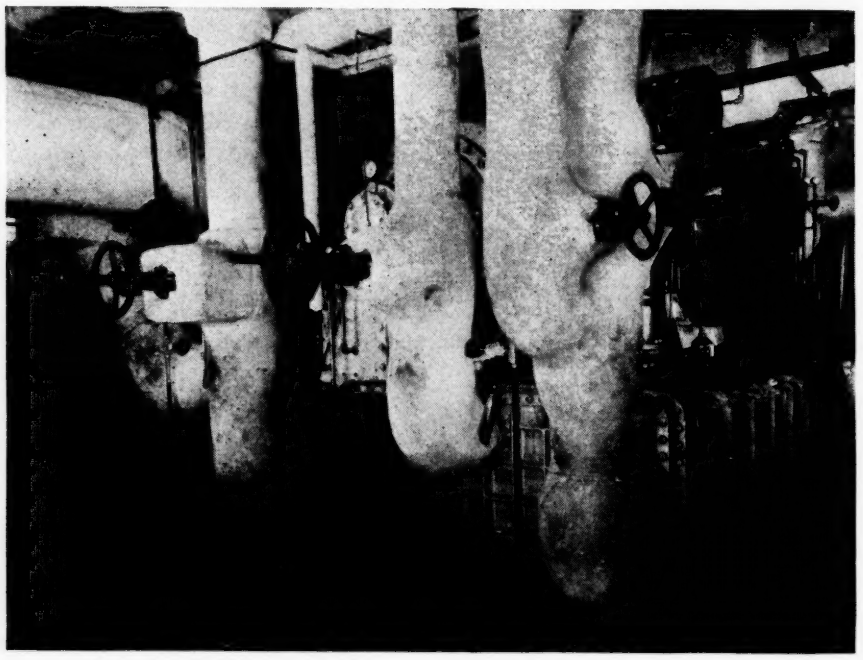
"The air cooling at the Macy store is accomplished by washing the air with artificially-cooled water, used over and over again and kept in circulation by two pumping processes. The first pumping process delivers the water to the various air washers and connected with the suction inlets of the air-washer pumps. The second pumping process forces the water through the spray nozzles of the washers, drops it into the air-washer tanks and thence returns it by gravity to the refrigerating machine. This method was necessary because of the varying elevations of the air washers and the varying distance of the same from the refrigerating machine.

"The maximum water distributed to the air washers totals 2000 gal. per min. and the power required for distributing this water is about 60 H.P. The main conveying this water from the refrigerating machine is 12 in. in diameter before any branches are taken off. For the return of this water there are two mains, respectively 12 and 10 in. in diameter after picking up the individual returns connected with the same.

"The nearest air washer is about 320 ft. and the farthest 720 ft. from the refrigerating machine. This is the horizontal distance measured along the water mains and does not include the vertical rise.

"The total air handled by the fans of the seven air cooling units aggregates 240,000 cu. ft. per minute. Under extreme weather conditions one-third of this quantity is fresh air taken from the outside and two-thirds recirculated air.

"As to the air distribution, all cooled air is introduced overhead and close to ceiling and all registers so located that air discharged by the supply registers is not short-circuited into the exhaust registers.



One of the Turbine-Driven 350-Ton Refrigerating Units

"In addition to this, there is also independent exhaust ventilation provided both for the first floor and the basement. This system is so arranged that it can be operated independently of the air-conditioning system and is of sufficient capacity to provide the requisite exhaust during the winter time when the system is used for supplying fresh tempered air at its full rated capacity, or 240,000 cu. ft. per min.

Thermostats Control Temperature and Humidity

"Complete thermostatic control is provided, making it possible to maintain any desired temperature and humidity within the range of the available capacity. Time does not permit a full description of this control. I might add, however, that the system used for the air cooling incorporates control of recirculated water at the air washers, as well as damper control for varying the air quantities passed through the air washers.

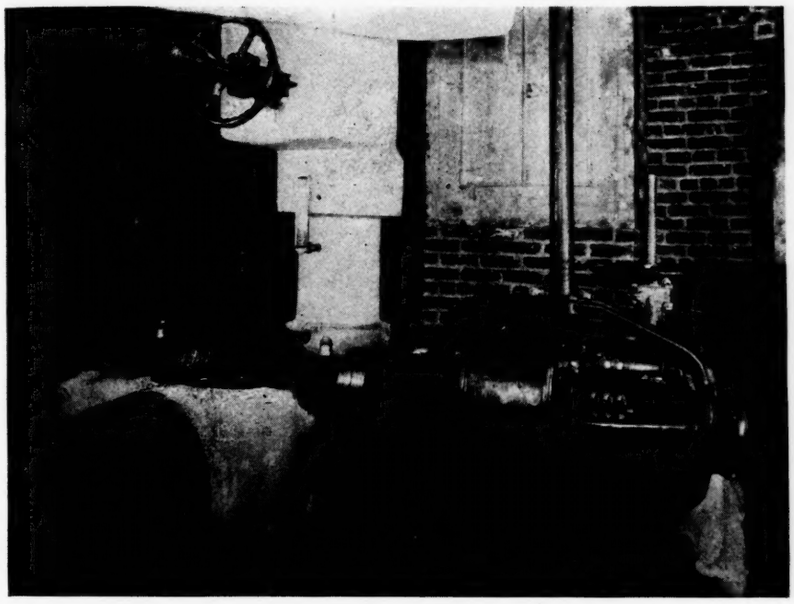
"For the control of the tempering stacks, the usual thermostatic system is used, consisting of duct thermostats controlling the steam valves on the tempering stacks.

"The refrigerating machine used in this case consists of two Carrier rotary machines, each capable of developing about 350 tons of refrigerating effect. This type of machine is too well known to require any description beyond a brief outline of the motive power used in this case.

"Each of the refrigerating units is driven by a low-pressure steam turbine capable of developing about 425 H.P. at a speed of 3600 R.P.M. This method was resorted to in order not to add this load to the already overtaxed dynamo plant.

"The specification stipulated that the power for the operation of the refrigerating machines should be generated with a steam pressure not exceeding 2 lbs. when working with a 26-in. vacuum. In actual practice, the specification requirements were fulfilled with a somewhat lower steam pressure. As a matter of fact, the machine operates with this exhaust steam from the Macy generating plant without having to raise this pressure above that usually carried in the summer time.

"The condensers used for producing the vacuum are of the usual sur-



Circulating Pump Delivering the Cooled Water to All Air Washers

face condenser type. Each turbine is provided with its own condenser, and the pipe line connecting each turbine with its condenser is 20 in. in diameter.

"The water used in the steam condensers is the same water used in the condensers of the refrigerating units. It enters from the street main at a temperature of 69° F., is first passed through the condensers of the refrigerating units, next passed through the steam condensers and thence to the sewer at a temperature ranging from 105° to 120°, depending upon the load carried.

"The water quantity used for these two condensing processes is about 1600 gal. per min. when the two refrigerating units are operated together at full load. Water is purchased from the city at the standard rate of $1 per 1000 cu. ft., and the maximum quantity used under full load conditions is about 85,000 cu. ft. per day.

"By this double use of the condensing water, together with the feature of utilizing exhaust steam for motive power (which exhaust steam would otherwise be wasted), the operating cost of this machine is reduced very materially.

"As a matter of fact, the only operating cost involved in this case is the cost of the condensing water, cost of the electric current consumed for circulating water and liquids within the refrigerating units, and the upkeep cost necessary to keep the machine in working order.

"As far as operating labor and attendance are concerned, there appears to be no additional expense involved, inasmuch as no attendant or mechanic has been added to the engineering force on account of the installation of this equipment. This applies to the refrigerating equipment in the sub-basement as well as to the cooling units scattered through the building.

"In addition to the usual gauges, thermometers and other instruments necessary for intelligent operation, a Caliscope equipment is also provided whereby both dry- and wet-bulb temperatures throughout the first floor and basement are registered on one central board located in the engine room."

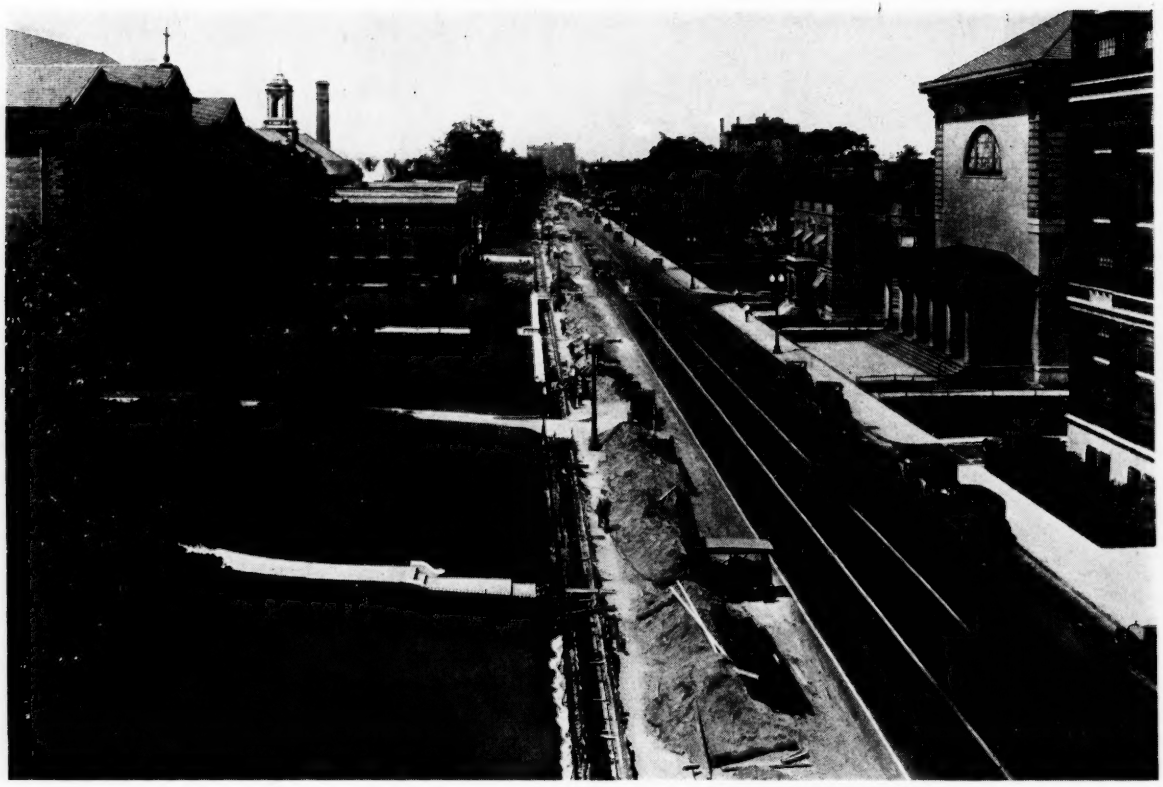
The Government's Enlarged Building Program

In his annual message to Congress, President Hoover had some interesting things to say regarding the government building program for the coming year. "It is expected," he stated, "that 34 new or enlarged buildings will be completed during the coming year and 40 during the fiscal year 1931. The program calls for a total expenditure of $300,000,000, in addition to the proceeds of sale of abandoned property. Individual projects already have been authorized by Congress at limits of cost in excess of $250,000,000. These were brought forward into the fiscal year 1930, appropriation balances aggregating $41,481,099. This is increased by appropriations made at the last session of Congress, amounting to $39,475,500, making the total amount available for expenditure $80,956,599. Of this amount the Treasury Department contemplates spending about $59,500,000 in the fiscal year 1930. The budget for 1931 carries estimates for public buildings, including the purchase of additional land in Washington, amounting to $30,000,000. Supplemental thereto an estimate of about $5,000,000 will be submitted at a later date when the Treasury Department has concluded its survey of new projects which it is desirable to undertake at this time. The appropriation of these amounts will provide the Treasury with ample funds to continue the work during the fiscal year 1931.

"The War Department is also carrying forward a building program, involving an ultimate expenditure of about $118,000,000, for the housing of military personnel, made necessary by the need for the replacement of World War temporary construction and to provide for the increase in the pre-war strength of the regular army. There has already been appropriated for this purpose $37,193,899, and $16,062,860 is carried in the estimates for 1931, with authority to make contracts for $3,000,000 additional. The estimates for 1931 also carry $3,311,000 for technical buildings for the air services of the Army and Navy and $3,176,000 for other buildings.

"Provision is made for construction projects at several Federal penitentiaries. For Leavenworth $22,000 is provided, for Atlanta $79,000, for McNeil Island $139,000, and $450,000 is included for continuing the construction of the industrial reformatory at Chillicothe.

"Altogether, this budget carries estimates of more than $59,240,000 for the construction of buildings, including the procurement of sites, with a contract authorization for a further expenditure of $3,000,000. To the sum of these two amounts there should be added the additional $5,000,000 for the public building program for which, as stated, an estimate will be submitted later in the year."



Building a District Heating System in Record Time

by **PAUL F. HELM** *and* **RAYMOND F. FORBES***

ACTING upon an order of the Indiana Public Service Commission to provide steam heating service for this winter's use, instead of abandoning its hot water system, the Indianapolis Power and Light Company constructed during the past summer what is believed to be the largest steam heating system ever installed in any one year by any utility. So great was the project that many engineers and contractors expressed grave doubts as to the possibility of bringing the work to completion in the time available, between two heating seasons.

For many years, this company has operated an extensive steam heating system serving the business district in the area known as the Mile Square in Indianapolis. The installation of steam mains described in this article replaces the company's hot water mains and adds to the existing steam system, resulting in a steam heating system interconnected with three plants, as shown on the accompanying map.

When the old hot water system was installed in 1901 and 1902, it served a residential section known as Morton Place, situated north of the business district. Age and inherent operating conditions made it inadequate for service to this community, which has changed, to a great extent, from a residence territory to one of many business buildings and apartment houses.

Since it was necessary to install the new heating mains in approximately the location of the old hot water mains, which were being abandoned, and also because certain changes were necessary on all customers' premises to adapt their heating equipment to the new steam service, the complete change-over had to be made during the summer months just past.

Plans were started last spring to proceed with the construction program, and a layout for a complete steam distribution system was made. In making this layout, consideration was given to the hot water connected load and to the future possibilities and advantages of district steam service for this locality.

In analyzing the situation, it was seen that approximately 47,000 ft., or nine miles, of underground steam mains had to be installed after the hot water system closed down May 20, and had to be ready to supply steam service at the beginning of the heating season, September 20. To carry out this project seemed quite a problem and was considered an unusual undertaking by many who studied the conditions.

Confronting all concerned was the fact that if heating service was not available at the beginning of the heating season, no excuse or financial bond would take care of the result-

*Engineering and research departments of Indianapolis Power and Light Company.

ing situation. The many residence customers served require heating service at an earlier date than other customers.

In facing this situation, the engineering work of the Indianapolis Power & Light Company was carried on under the supervision of E. G. Ralston, vice-president and chief engineer, in conjunction with F. E. Laramore, of the Management & Engineering Corporation, the operating and engineering division of the Utilities Power & Light Corporation, of Chicago.

Due to certain operating conditions and with the present steam system operated at low steam pressure, the decision on the new mains was for a low-pressure system, with the initial steam test to be at 75 lbs. per sq. in. pressure. Later, after a survey of this territory and vicinity by the engineers of the American District Steam Company, some changes were suggested which were embodied in the layout to provide for better future expansion possibilities.

The contract for the total installation, as contemplated, was given to the Northeastern Piping and Construction Corporation, which is the construction and engineering subsidiary of the American District Steam Company. The contractor assumed full responsibility for all work except repaving and service lines. Satisfactory contract provisions were agreed upon fully to protect the company against the possibility of any of the work not being completed before the start of the heating season.

Due to the deteriorated condition and out-of-date equipment of the old hot water plant and the fact that this plant was far distant from the railroad siding for coal delivery, the proposed plan provided for steam to be supplied from the Mill Street plant through a 20-in. main, 3370 ft. long, to the distribution system. Since it was possible to install this 20-in. main without disturbing the hot water mains in use, the installation was started April 15, one week after the signing of the contract covering the work.

Fig. 1 shows the first crew starting work on the 20-in. main installation April 15. Fig. 2 shows the same location 2½ days later and is illustrative of the progress made. In the work schedule set up, 40 days were allowed for completion of the 3370 ft. of this 20-in. main. It was finished in 27 days elapsed time, which included 11 days of rain during the period.

Fig. 2. Same Location as Fig. 1, 2½ Days Later

With this line completed, little work could be done until May 20, but following the closing down of the hot water system, the installation of the complete steam distribution system was started. Considerable enthusiasm was evidenced by all foremen, and as the work progressed, five crews were formed and the working force was increased to approximately 400.

Construction work was carried on day and night. Numerous 1000-watt flood lights were provided for night operations. At no time during the progress of this work was there a delay for lack of materials and every move was coordinated with the other steps in the construction. The only cause for any line of trench to be vacant at any time was rain, which occurred during 19 days, while this work was in progress.

Pavement breaking and trenching to grade-line was done mostly during the daytime. All other work of placing drain tile, gravel for base, cement base, placing and welding pipe, conduit work and back fill followed close behind. Cement base was completed each night to the end of the trench graded that day. Quick setting

Fig. 1. Starting Work on 20-In. Main Installation, April 15

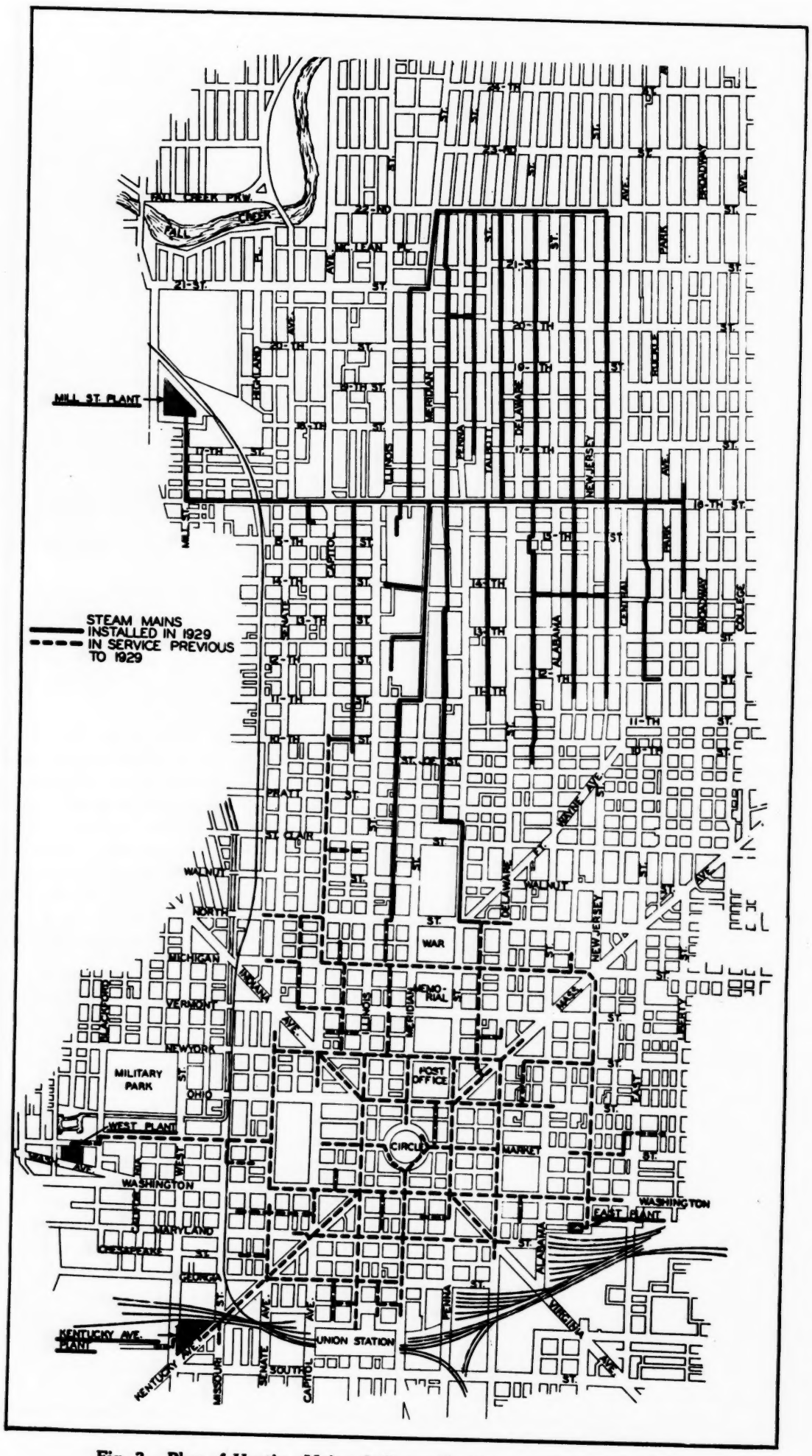


Fig. 3. Plan of Heating Mains, Indianapolis Power and Light Company

cement was used, allowing pipe to be placed on the base the following day. Pipe welders and masons did not seem to know when regular working hours were ended; the object was to follow the preceding completed part of the work as closely as possible and have their part finished before the next morning.

Consisting of 47,247 ft. of mains, the distribution system was completed in 81 days, ready for steam to be turned into these mains August 1. During this period, an average of 583 ft. of pipe was installed per day. The best week was July 14-19, with no rain, and 6587 ft. of pipe were laid and tested in place, an average of 941 ft. per day.

In connection with the installation, three extensions totaling approximately 8000 ft. of 12-in. and 8-in. mains were started and completed by September 22. The completion of these and other shorter extensions brought the total length of the mains in this new system ranging in size from 20-in. to 4-in. to 59,451 ft. or 11¼ miles and all installed between April 15 and October 1, last year.

An indication of the magnitude of this installation is given by the quantities of materials used, as follows:

- Approximately 450 tons of steel pipe.
- 105,000 pieces of 4-in. drain tile.
- 3300 cu. yds. of concrete in place.
- 209,000 pieces of multicell tile.
- 365,000 brick for manhole construction.
- 306 manholes built complete with curbs and covers.
- 98,000 lin. in. of welding on pipe lines (over 1½ miles).
- 91 trap installations complete.

This material, exclusive of sand and gravel, aggregated approximately 160 carloads.

All of the conduit construction was of Adsco multicell tile. The concrete base, 4 in. thick and of a width varying with size of mains, was laid over coarse gravel, with farm drain tile underneath to take care of under drainage. Guide rollers spaced 12 ft. apart on the base supported the pipe.

Acetylene and electric arc welding were used and the main was tested at 90 lbs. air pressure in sections between expansion joints. All pipe and fittings were then painted with nitrose paint before the pipe was covered.

Dabonite insulation, with waterproof jacket, a pipe covering made especially for the American District Steam Company by Philip Carey Company, was used, 2-in. thickness on 10-in. and larger pipe, and 1½-in. thickness on 8-in. and smaller pipe.

Conduit side walls were built of special salt-glazed multicell tile, which are similar to building tile, sizes 4 in. x 8 in. x 16 in., and 6 in. x 8 in. x 16 in., with two and four longitudinal air cells, respectively, with mortar locking grooves on each edge. The conduit wall thickness was 6-in. for 12-in. and larger pipe, and 4-in. for 10-in. and smaller pipe.

After the side walls were built up, a reinforced concrete roof 4 to 5 in. thick was laid over the corrugated iron top, with ⅜ in. reinforcing bars spaced 6 in. on centers laid ¾ in. above the bottom.

All concrete was 1-2-4 mix. This construction is shown in Fig. 5. No flange connections were used except for expansion joints and valves located in manholes and these fittings in manholes were tested under steam pressure before being covered.

While in most cases, the right of way was established by the abandonment of the hot water mains, yet difficulty was experienced in allowing clearance for other utility properties.

Manholes were of brick laid in cement mortar construction. In most cases the mains are below the sewers, so the traps are located in individual manholes, constructed off at the side of the line of pipe. The trap discharge is carried into a sump, approximately 5 ft. deep and 3 ft. in diameter, filled with old brick, below the bottom of the manhole. The soil conditions in this territory are so sandy that it is necessary to sheet for most of the trench work.

In addition to the installation of these steam mains by the Northeastern Piping and Construction Corporation, service lines, repaving and the installation of meters were handled by the Indianapolis Power and Light Company's organization. Approximately 300 service lines and meters were installed. Due to the fact that the greater number of connections are to residences, the ser-

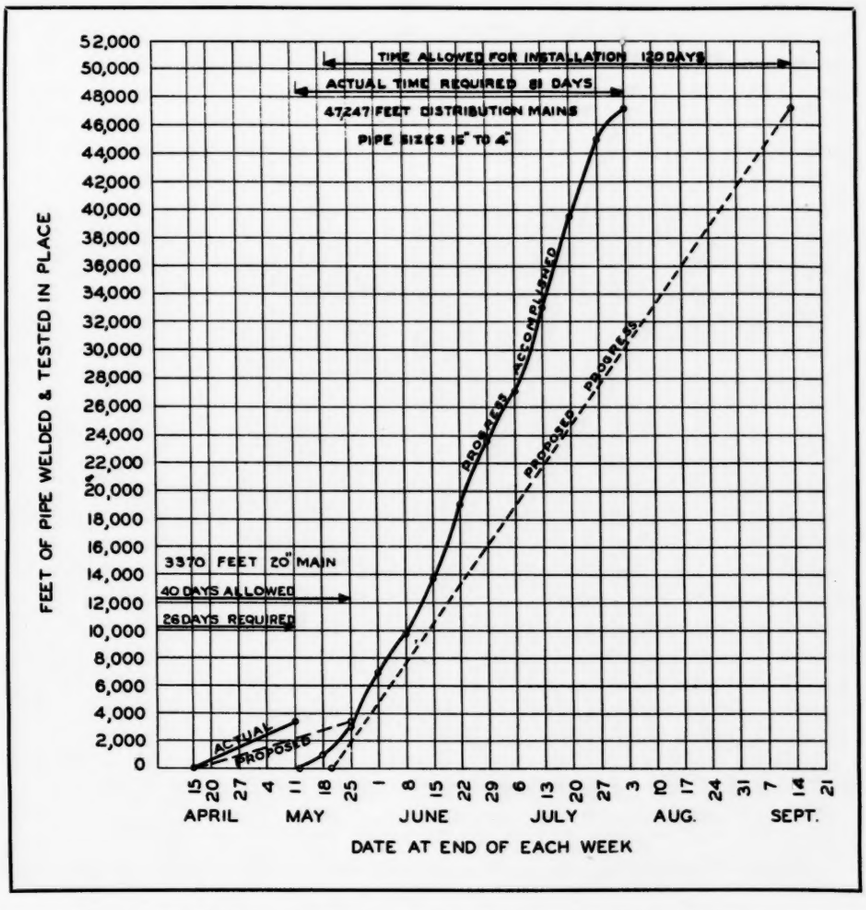


Fig. 4. Work Progress Chart, Showing Proposed and Actual Progress in Laying Pipe

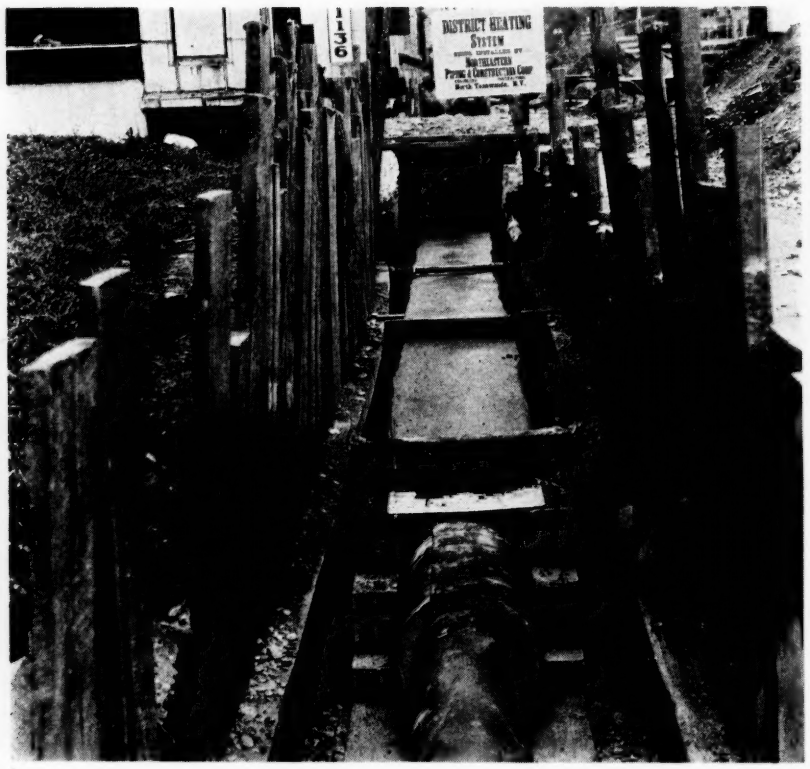


Fig. 5. No Flanges Were Used Except for Expansion Joints and Valves

vice lines are of unusual length. The minimum size service pipe is 2½ in. to insure proper drainage of condensate, which is returned to the main, where possible.

Steam was turned into this heating system several days earlier than needed in order to permit customers to test out their equipment. The system has been in operation since that time, operating satisfactorily.

The number of customers connected for this new service is quite gratifying and in view of the fact that the business district of the city is extending rapidly into this territory, with the prospects also of many additional apartment houses, it is expected a considerable additional load will be connected in the future.

It is an interesting fact that the heating system of the Indianapolis Power and Light Company is the largest low-pressure system in the world. It has a total connected load of approximately 2,500,000 sq. ft. of radiation, necessitating an output from the three steam-electric plants now supplying it of more than 2,000,000 lbs. of steam annually. As all this steam is discharged into a non-return system, the problem alone of treating all this water is of considerable importance.

Previous experience in the operation of similar water softeners in the other two steam-electric stations led to the adoption of a lime and soda ash hot-process softener with sand filters for treating all water fed to the boilers used for steam heating at Mill Street station. Experience, too, had indicated the feasibility of using, in conjunction with the softener, a certain special arrangement for blowing down boilers, which gives promise of great success.

It is believed that at the close of the season highly satisfactory steam heating service will have been rendered to the patrons of the Indianapolis Power and Light Company by reason of the newest, most modern type of steam mains installed, backed by adequate boiler capacity and scientific boiler-water treatment.

Fig. 6. Network of Pipes Encountered by the Heating Company

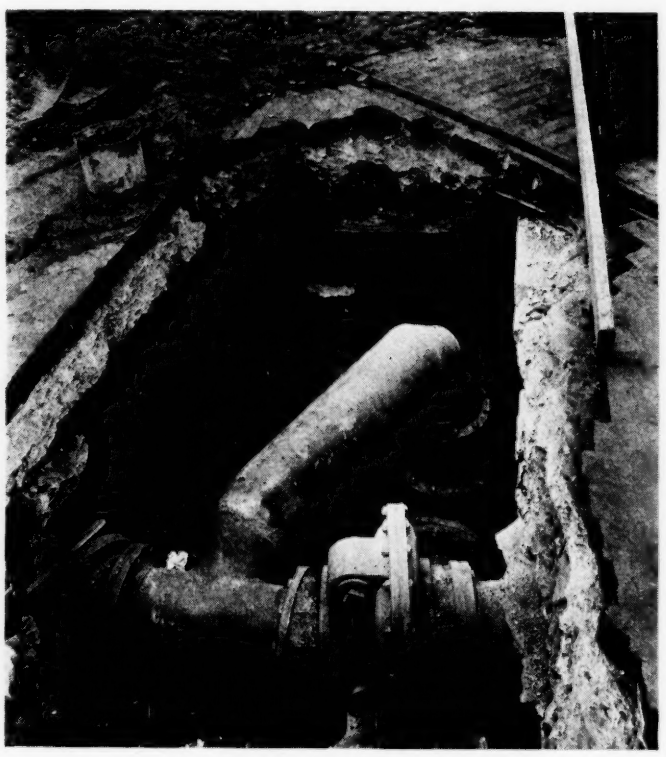
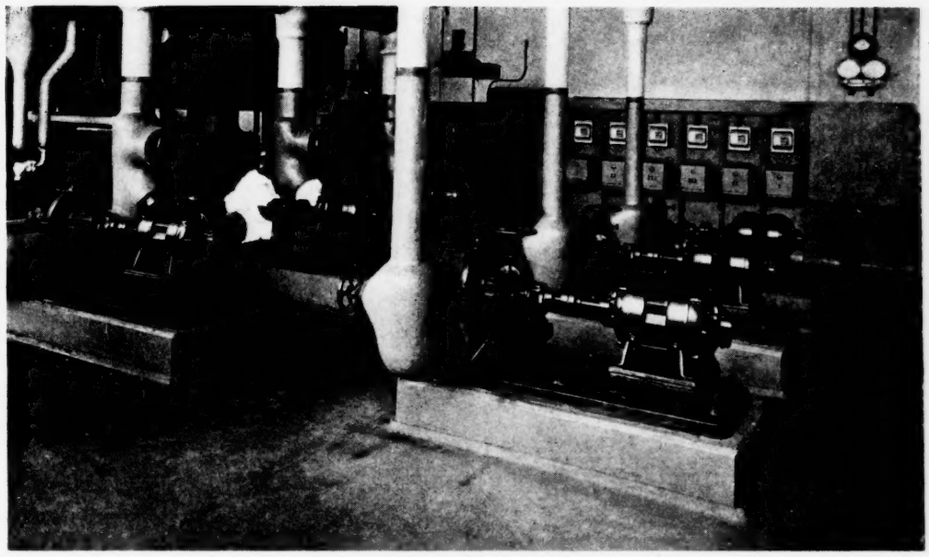


Fig. 7. Tie Connection at Meridian and Maryland Streets



Squirrel Cage Induction Motors Operating Pumps

Electricity—Its Application to Heating and Ventilating

by **R. M. ALSPAUGH**

General Engineering Department, Westinghouse Electric & Mfg. Company

TODAY electricity has become a most important commodity in our homes, office buildings, and factories. It is such a useful servant that every one, especially those in the building trades, should be on speaking terms with it. The characteristics of both direct and alternating current, magnetism, and the common electrical terms—squirrel-cage motors, synchronous motors, three-phase systems, power factor and other terms appearing in literature of trade journals—will be discussed in this article.

There have been many theories as to just what electricity is. According to the present theory electricity is the flow of electrons through a conductor, much the same as molecules of water flow through a pipe. The water pressure which forces the water through the pipe against the pipe resistance corresponds to the voltage or electrical force required to make electric current flow through a conductor against the electrical resistance of the wire. Current obtained from batteries, of course, is known as direct current and flows in one direction. Direct current is also obtained from direct-current generators, or from alternating-current systems by means of motor-generator sets, rotary converters, or rectifier tubes.

In mechanics, power is expressed in foot-pounds per minute or horsepower. One horsepower = 33,000 ft. lbs. per min.

Thus the power required to lift 2000 lbs. of water 40 ft. in 1 min. is 80,000 ft. lbs. per min. or 2.42 horsepower, one horsepower being equivalent to 33,000 ft. lbs. per min.

If the operation was continued for 1 hr. the energy expended would be 2.42 horsepower hours.

Electrical power is measured in watts, which for direct current is:

Watts (W) = Voltage (E) × Current (I).

A customer's monthly electricity bill is based on the kilowatt-hours (1000-watt hours) used per month.

The most significant effect of electric current in a conductor is the magnetic field set up on the outside of the wire.

If a compass or magnetized needle is held near a wire carrying current, the needle will be moved cross-wise to the wire by the force of the magnetic field around the wire, which is proportional to the current (b-Fig. 1). Or, if the two poles of a horseshoe magnet are placed over a wire that is carrying current, the wire tends to move out of the magnetic field of the magnet (e-Fig. 1). This magnetic effect is utilized in practically all electrical machinery. In a direct current motor the pole pieces correspond to the horseshoe magnet and the conductors on the armature correspond to the moving wire.

It has been shown that the flow of electricity is always accompanied

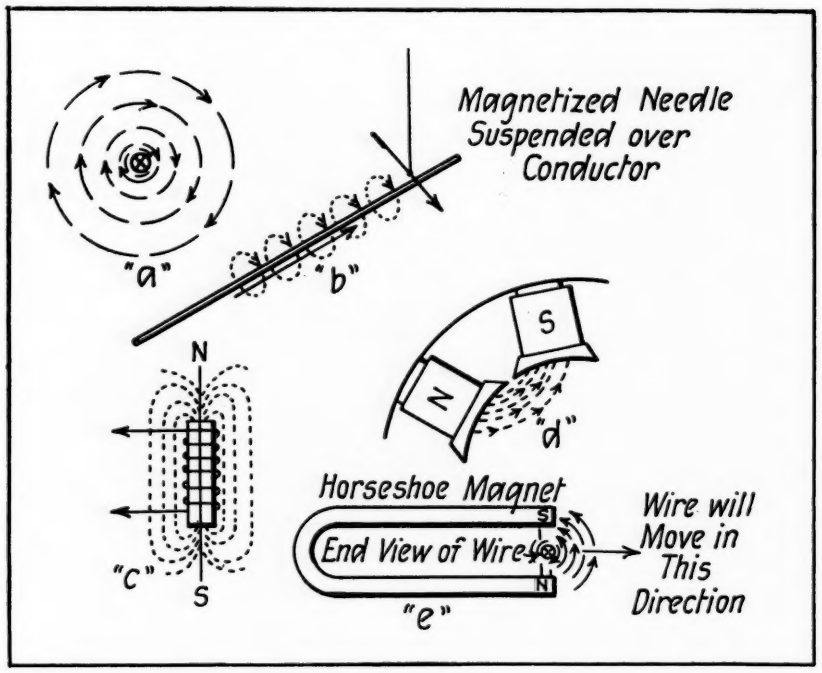


Fig. 1. Magnetic Effect of Current in Wires

by the formation of a magnetic field. In like manner, if a conductor is moved through a magnetic field a voltage is induced in the wire. If one side of a loop of wire is passed through the field of a north pole (d-Fig. 1), a current will flow. If the wire is passed in the same direction through the field of a south pole, current will flow in the opposite direction. This is the principle of an alternating current generator. Alternating current is also induced in the armature coils of a direct current generator, but the commutator acts as an automatic reversing switch so that the current flowing from the brush is always in the same direction.

60-Cycle A. C. Reverses Flow 120 Times per Second

If a water system with no check valves has a plunger in the pipe which reverses continually, the direction of the water flow will reverse with the piston. The effect of the force applied at the plunger is felt all along the line, but the water does not circulate. This is analogous to an alternating current. The current in our 60-cycle power systems reverses 120 times per second.

Today 98% of all electrical power generated in this country is alternating current. The principal advantage of alternating current power is that it can be transmitted at high voltages (23,000 to 220,000 volts) economically and can be transformed to low and safe operating voltages (110 to 220 volts) at the point where it is to be used. This voltage transformation is accomplished with very little loss of power by means of transformers.

As with direct current, the flow of alternating current is accompanied by a magnetic field. This field alternates with the current, increasing to a maximum in one direction then decreasing to zero and increasing to a maximum in another direction. If a wire is placed alongside a conductor in which alternating current is flowing, a current of the same frequency will be induced in the wire by the alternating magnetic flux surrounding the conductor. This is the principle of the transformer.

A transformer consists of two windings—primary and secondary—wound on an iron core. The primary winding is connected to the source of alternating current power. The secondary supplies power at the same frequency as the current in the primary and at a voltage which is to the primary voltage as the ratio of the number of turns of wire in the two windings. That is if the secondary winding has half as many turns as the primary winding, the secondary voltage is half the primary voltage and the secondary current will be twice the primary current, neglecting losses in the transformer.

Power Factor

A peculiar characteristic of alternating current is that the peak of the current wave may occur before or after the peak of the voltage wave. The water analogy can be modified to explain this phenomenon. If an air chamber is placed in the water system on each side of a reversing piston, the motion of the water will lag behind the motion of the piston. The same is true of an alternating current. Inductive cir-

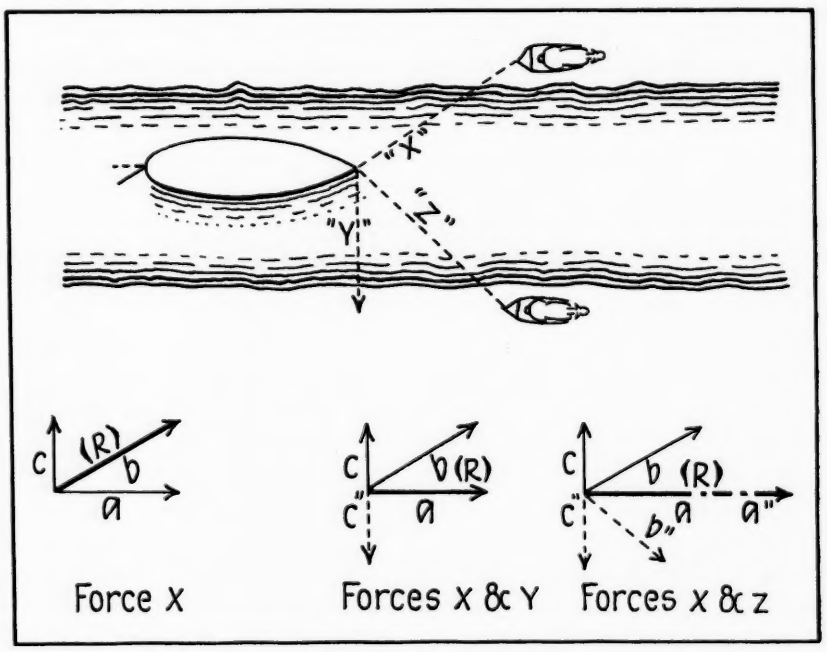


Fig. 3. Tow Boat Analogy of Energy Component and Wattless Component of Electric Current

cuits, such as induction motor, transformers and electric furnaces, have a lagging current. With an oscillograph, it is possible to record the current and voltage waves, similar to those shown in Fig. 2, upon a photographic film. The current in lighting circuits is in phase with the voltage while the current passing through a condenser leads the voltage. The relation of the current to the voltage in these three cases is expressed as lagging power factor, 100% power factor, and leading power factor, respectively.

A horse pulling a wagon is comparable to alternating current power, having 100% power factor. That is, all of the force exerted by the horse is applied in line with the direction the wagon is moving. If this horse is walking along the bank of a canal, pulling a tow boat, the force exerted on the tow line is at an angle to the motion of the boat and the rudder must be turned to "offset" the force tending to draw the boat towards the bank.

One Component Only Acts Parallel to Motion

The force on the tow line may be divided into two components—one force acting in the direction the boat is moving and one acting at right angle to the direction of motion. Obviously the latter force is wasted. Referring to Fig. 3, it may be seen that although the horse is exerting a force proportional to the line "b," only the force represented by line "a" is effective in moving the boat forward.

Any alternating current can also be divided into an in-phase or energy component and a wattless component or one that is at right angles to the voltage (Fig. 4). Power factor is the relation between the useful power "a" and the apparent power "b", or P. F. $= \frac{a}{b}$

Only the in-phase current is useful. Yet the power company's generators and transmission lines must be built to carry the total current. To transmit a maximum of useful power over their lines the power companies are anxious to maintain high power factor loads upon the line. Many companies offer reduced rates to customers who take a high power factor or a leading power factor current. Thus it is an advantage to both the customer and power company to keep the power factor of the load near 100%.

How can the power factor of a system be improved? Referring to the tow boat illustration, another tow line "Y" may be attached and a pull exerted from the opposite bank to balance the force tending to pull the boat to the side. A diagonal force "Z" would also correct the force exerted at right angle to the boat's motion and would at the same time add an additional component of force in the direction the boat is traveling. Thus the resultant force supplied to the boat is the summation of all of the numerous components.

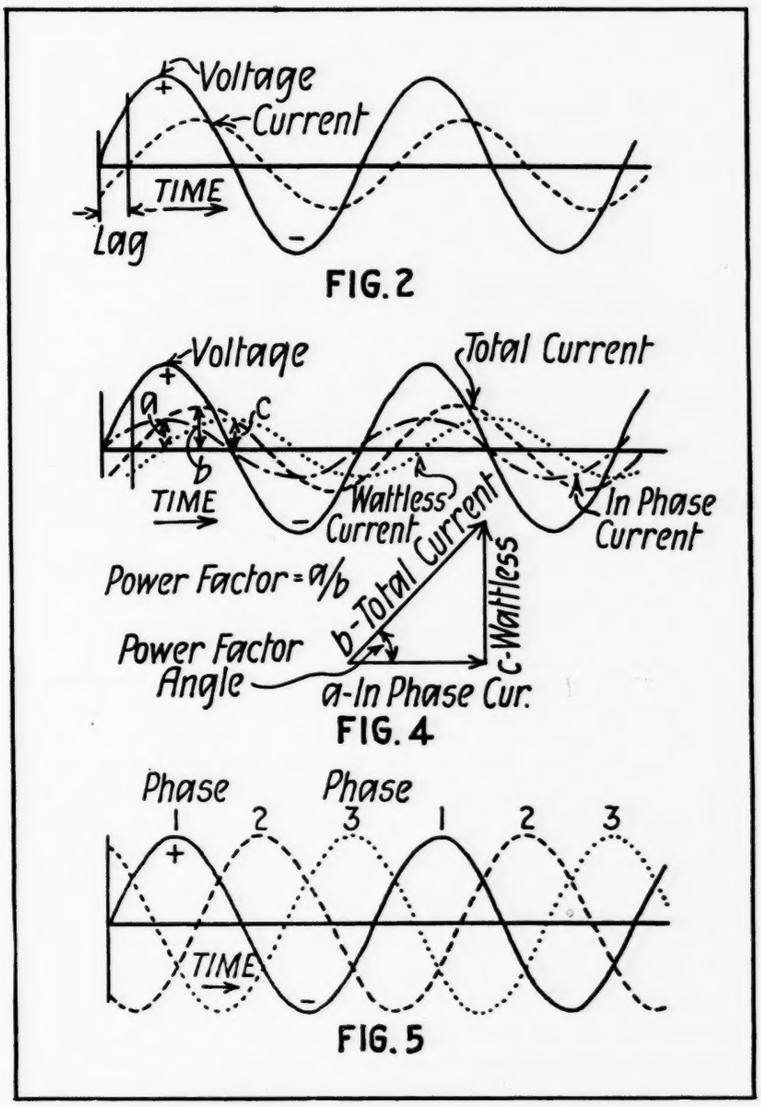


Fig. 2. Current and Voltage Waves as Recorded by Oscillograph
Fig. 4. Components of Electric Current
Fig. 5. Current Waves in Three-Phase Line

Current in a transmission line is the resultant of all the leading and lagging currents in the various branches. A lagging power factor may be corrected by adding static or synchronous condensers to the line.

A static condenser corresponds to the force "Y" of Fig. 3, and the synchronous condenser corresponds to the diagonal force "Z." That is, a synchronous condenser, which is merely an over-excited synchronous motor, can be used to improve the power factor of the line and to also furnish mechanical power.

As was explained in a previous paragraph, an electric current is induced in a conductor which passes through a magnetic field. A three-phase alternating current generator has three separate groups of con-

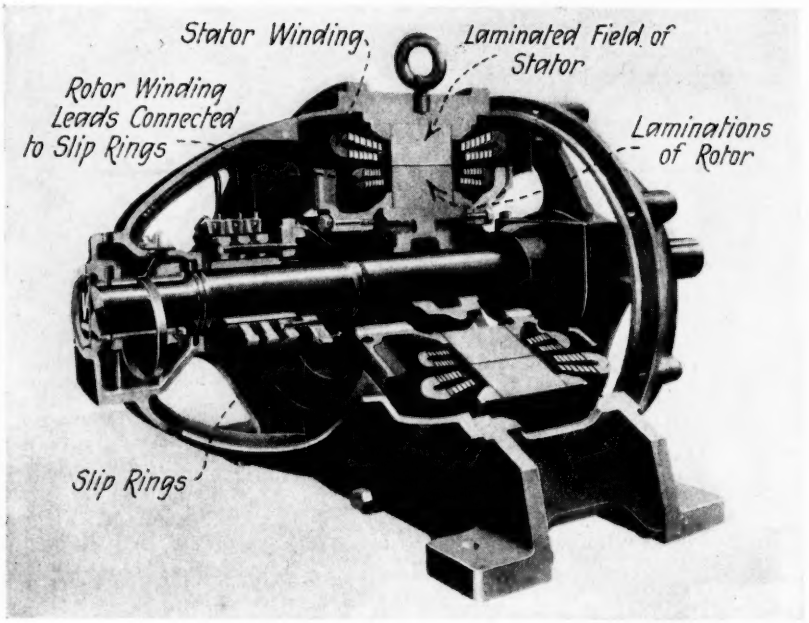


Fig. 6. Wound Rotor Induction Motor

ductors on the armature so arranged that when the conductors of one winding are in a strong magnetic field directly under the poles of the generator, the conductors of the other windings are near the edge of the poles on either side of the first winding. Because of this relative position of the windings the induced currents in the three windings are in different sequence or phase. The current peak occurs successively in windings 1, 2 and 3 (Fig. 5). Practically all power systems are three phase, but lights and small motors can be operated from any one of the three phases.

Three phase windings on the stationary part, or stator, of synchronous or induction motors are so distributed that the individual pulsating currents passing through the windings produce, in effect, a rotation of current which is accompanied by a rotating magnetic field. In single phase induction motors, connected to one phase of the line, the rotating field is obtained by artificially inducing a second phase in the winding.

Low speed synchronous motors make an ideal drive for all classes of reciprocating pumps such as ammonia compressors for refrigeration systems, vacuum pumps, air compressors and water pumps. Flywheel effect can be added to the rotor of these motors where needed.

High speed synchronous and squirrel cage induction motors are being widely used for driving centrifugal water pumps, centrifugal oil pumps, fans and blowers. Many of the fractional horsepower motors used on heating installations to supply a mechanical draft or to pump fuel, oil, and the motors used in many household appliances are split-phase induction motors operating on single phase alternating current circuits.

With the exception of the transformer, the invention of the induction motor has done more to promote the use of alternating current and the consequent growth of our modern power system than any other invention. This type of motor is the simplest and most popular form of electric drive.

There are two general classes of induction motors, namely, the squirrel-cage motor and wound rotor motor. In both types of motors the rotating magnetic field produced in the stator windings, which are connected to three-phase power source, cuts the conductors on the rotor and induces a current in these short-circuited rotor windings. The reaction between this induced current and the rotating field causes the rotor to revolve with the field.

At the instant of starting, the rotating field cuts the rotor conductors at synchronous or maximum speed and induces a heavy current of line frequency in the rotor. This heavy current gives the rotor a high starting torque which quickly brings the motor up to near synchronous speed. As the rotor speeds up, its conductors cut the magnetic field at a much slower rate, less current is induced in the conductors, and the motor torque decreases until at approximate synchronous speed the torque is just sufficient to overcome bearing friction. When a load is applied, the rotor slows up until it cuts more lines of magnetic force.

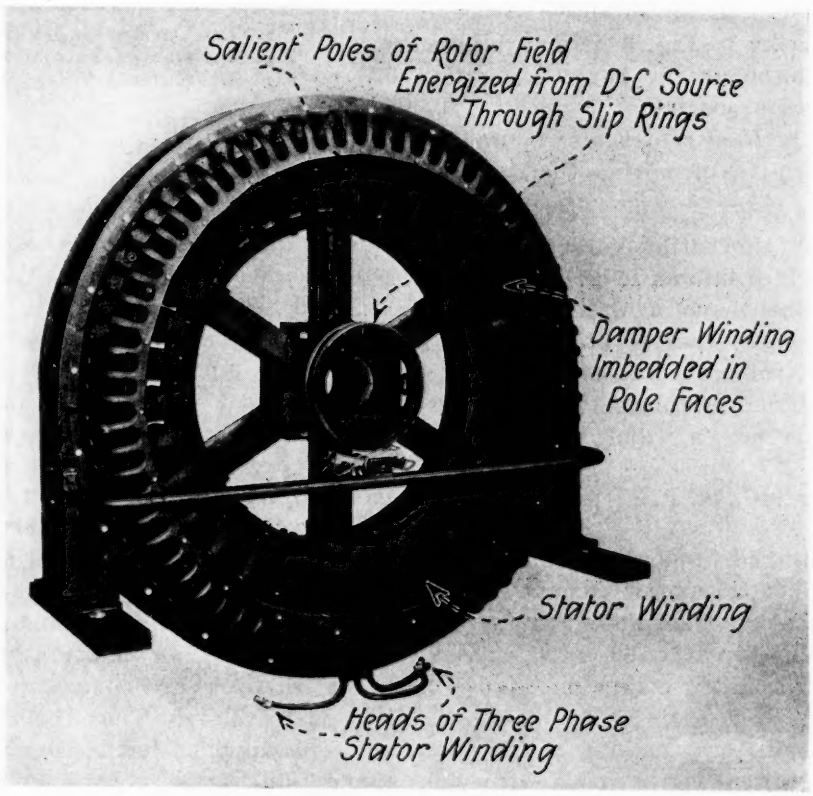

Salient Poles of Rotor Field Energized from D-C Source Through Slip Rings
Damper Winding Imbedded in Pole Faces
Stator Winding
Heads of Three Phase Stator Winding

Fig. 7. Synchronous Motor

Wound-rotor induction motors are used for driving large ventilating fans when it is desirable to vary the volume of air supplied. The ventilating system of the Holland vehicular tunnel under the Hudson River is equipped with induction motors of the wound-rotor type. The speed of the ventilating fan motors can be adjusted to meet the changing requirements.

Induction Motors Differ in Rotor Windings

The difference between synchronous speed and rotor speed is called slip. Synchronous speed expressed in revolutions per minute, for any A.C. motor, is the number of alternations of current per minute divided by the number of poles in the motor. Synchronous speed for a four-pole motor operating on 60-cycle current (7200 alternations per minute) is 1800 R.P.M.

Practically all modern induction motors are designed to start at full line voltage, but where the drop in voltage resulting from the sudden rush of starting current causes a severe disturbance to the power system, auto-starters (transformers with reduced voltage taps) are used to start the motor at reduced voltage and limit the starting current.

The two classes of induction motors differ only in the construction of the rotor windings. Squirrel-cage motors, which are suitable for constant speed applications, have heavy copper conductors imbedded in slots in the laminated iron rotor. All conductors are connected together at both ends of the rotor to form a short-circuited winding—no external leads are brought out.

Wound rotor motors have a three phase winding on the rotor which is similar to the stator winding. Leads from these windings are connected to slip rings which are in turn short-circuited through a controller and an external resistance. These motors are used for service requiring speed adjustment, high starting torque, or low starting current. The external resistance is in the rotor circuit during starting, but it is cut out as the motor speeds up.

The synchronous motor operates at synchronous speed at all loads. Electro-magnets on the rotor, corresponding in number to the number of poles generated in the stator, follow the rotating field produced by the stator windings in much the same manner as a compass needle follows a magnet that is revolved around the compass. These poles are energized from a direct current source. The attraction between them and the poles of the stator and consequently the load the motor can take depends upon the excitation or the amount of current in the rotor circuit. The stronger the excitation, the stronger is the pull between the stator poles and the poles on the rotor.

Synchronous motors have one marked advantage over induction motors, namely, the power factor of the motor can be controlled. Changing the excitation changes the power factor of the alternating current taken by the motor. If the motor is designed to operate at 100% power factor with normal excitation, it will take a leading current if over-excited or take a lagging current if under-excited. The synchronous motor can be used to correct for lagging power factor current taken by inductive apparatus such as induction motors and transformers.

Most standard synchronous motors are started and accelerated as induction motors. A damper or squirrel-cage winding imbedded in the pole faces of the rotor is provided for this purpose. When the motor is running at approximately synchronous speed the windings on the poles of the rotor are excited to pull the motor into step.

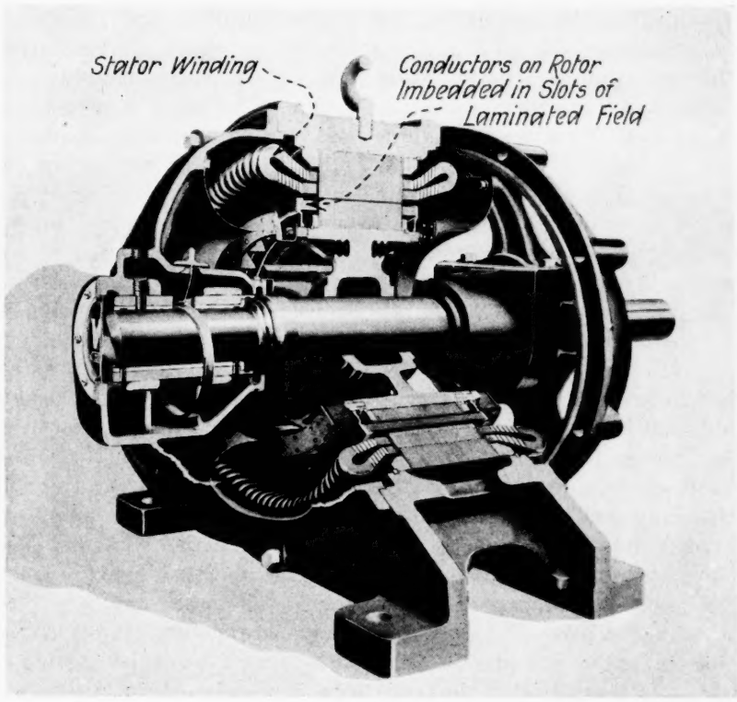


Fig. 8. Squirrel Cage Induction Motor

Weather Bureau Seeks Data on Dust in Air

Dust is ordinarily only "matter out of place," but its possible effects on observations made by weather bureaus are expected to be shown to some extent hereafter through installation of a new instrument called a "Direct Vision Dust Counter" at various Weather Bureau stations, according to Tycos Quarterly.

Records of the bureau show that there has been a slight decrease in radiation from the sun during the last 17 years. Officials believe that data over a period of years on the dust count of the atmosphere may reveal some relationship. Whether a change in the use of coals is the cause, or whether some other factor is responsible may be revealed by the observation on dust.

The instrument consists of a microscope, an air pump, object glasses, and mirrors whereby dust from a known quantity of air is collected and counted. Speculation has long been made on the possible effect of volcanic dust on weather and the effect on temperatures of dust which decreases radiation from the sun. The new dust counter will be of use only for the lower atmosphere, and will be of no use in taking into account dust in the higher regions of the air.

Proper Distribution of Air and Heat Is Obtained in the Allen School, Elyria, Ohio

Obtaining Even Temperatures in a School Building

by **H. M. NOBIS**

Consulting Engineer, Cleveland

THE best schoolhouse is the one which fulfills the requirements of healthfulness and dollar value with the least expenditure in first cost, operation and maintenance.

Healthfulness in schoolhouses includes healthful location, good water, sanitary plumbing, maximum sun, minimum dust, and freedom from soot and smoke. It also includes good building construction for durability, low heat losses, minimum of noise transmission, elimination of dirt-harboring areas and the adequate heating and ventilation of all rooms.

By "dollar value" is not meant the purchase of good material below its sound market price. The satisfaction of both seller and buyer must be considered, hence it covers the application of good engineering which, when recorded on paper, guarantees the desired results to the purchaser before the actual work has started.

Good heating and ventilating is based essentially on the strict observation of natural laws which suggest simplicity. Simplicity is not cheapness in heating and ventilating. Its sound value includes the getting of results, maximum life of materials and the operation and maintenance of an all-round efficiency.

It is not an easy matter to combine hygienic requirements and dollar value, warranting results even from a technical point only, but it is much more difficult to combine these requirements in such a way as to guarantee an economical operation, when applied to human and mechanical energy.

It is well-known that the majority of the school boards do not pay the requisite wages for the operation of an elaborately-equipped heating and ventilating system, hence the often-heard complaint that the equipment is not properly operated.

As an assurance of proper operation is so hard to procure, this actual condition must be considered. The starting point should be on the basis that out of 365 days manufactured heat is furnished on an average of 220 days.

State laws provide for a minimum of temperature and air delivery in quantities which were arrived at in the days when woolen shirts were in vogue. The medical profession does not set a definite standard, and rightly, considering the various climatic and economic conditions between city and country. Busy school people soon become tired of registering complaints because many suggestions bring no relief. Such suggestions include open or closed windows; open or closed doors; hot, warm, or cool air; shorter or longer radiators; more fuel; another make of traps, etc. Shall the children set the standard?

Lack of active cooperation with the children compels us to admit that we know very little about them. School-building authorities are responsible for the physical comfort of the child. Can the same comfort standards suitable for a fat boy be applied also in the case of a thin girl? (Undernourishment not considered.) The fat child indicates minimum and the

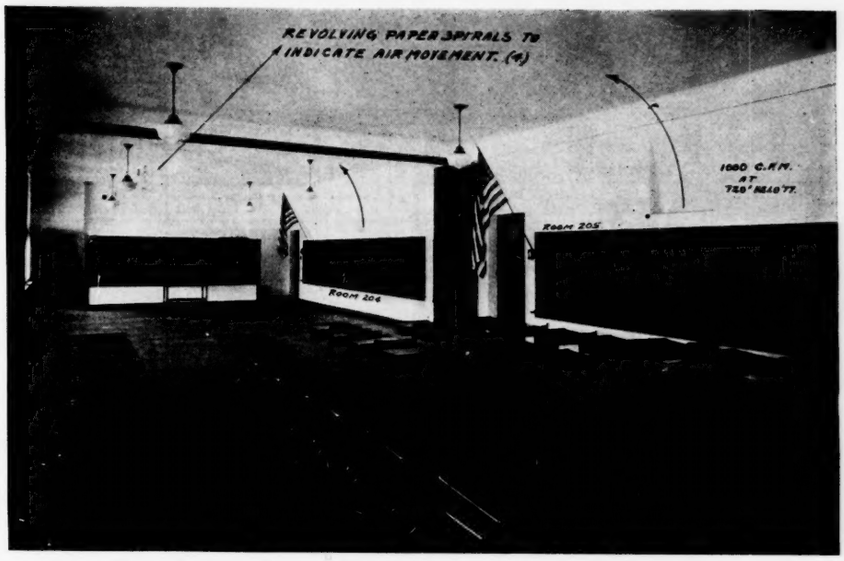
thin child maximum oxygen consumption—energy wastage. Should both be subjected to the same temperature?

Some day we shall know better, but up to now we must admit, in justice to future improvements in the heating and ventilating industry, that it is impossible to satisfy every teacher and child in a classroom.

There was a time when the manipulation of room temperatures was accomplished by the regulation of stoves, windows and doors. Public opinion demanded better standards and the fan blast system came into use. Outside air was employed to temper and hold in balance the rate of body heat output.

The high air temperatures which warm-air systems employ, to overcome the heat losses from windows and walls, made the distribution of even temperatures in the room very difficult, this condition being especially noticeable when the accupants shed their homespuns. However, body temperatures remained the same, about 87° for boys and 81° for girls within the clothing. Naturally better standards were demanded, led by women, who seem to take the initiative when it comes to healthful comfort demands.

However, it takes men to fill these wants, and so there were introduced a number of heating and ventilating systems which did give ideal results on paper, but not in practice. Competitive spirits were competing for leadership. The unit heater makers discovered dust-laden distributing ducts; that air-freshness was lost through contact with metal ducts; complicated operation; air stratification causing overheating and stuffiness; costly alterations to suit building enlargement. Central fan adherents didn't like the motor noise, the conversion of the teacher into an engineer, the lack of humidity or effective dust removal.



View of Two Classrooms Showing Air Inlets and Paper Spirals

Through practical experience gained in the remodeling of a number of unsatisfactory heating and ventilating systems in school buildings, I found defects which should not be repeated. These defects consisted of local drafts, caused by the cold air falling from window areas beneath which there were no radiators; the introduction of new air in a horizontal plane, and, not the least, the maintenance of a negative ventilating pressure in the classrooms. These principal faults brought in their trail a number of operating difficulties, especially with automatic temperature control systems, which, by the way, are the most essential item to warrant a continuously satisfactory operation.

It is my present opinion that to assure good classroom conditions, according to the prevailing comfort standards, the following principles should be followed:

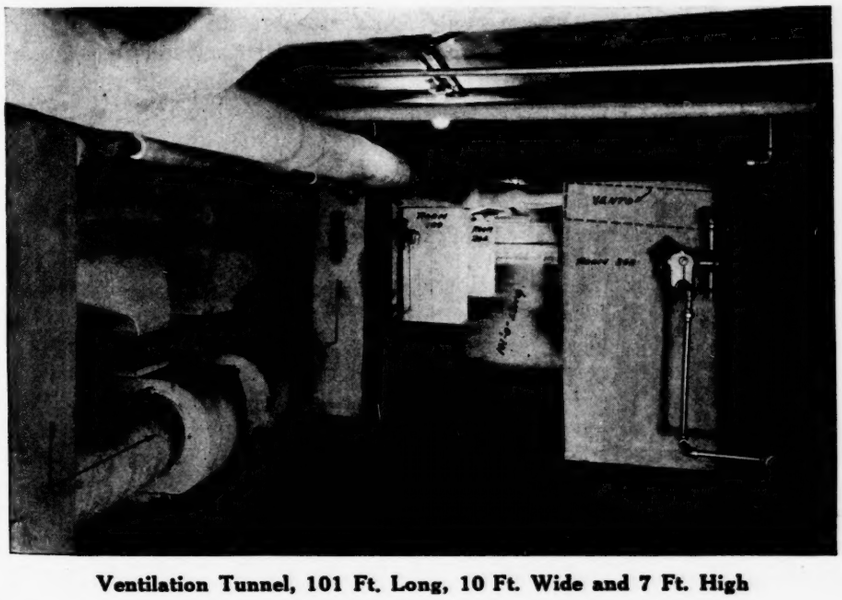
The Desire:

Satisfactory heating and ventilating (winter operation) of a schoolroom means the even distribution of radiated heat, the introduction of a certain amount of new air, at or below the room temperature, without causing drafts in the occupied area.

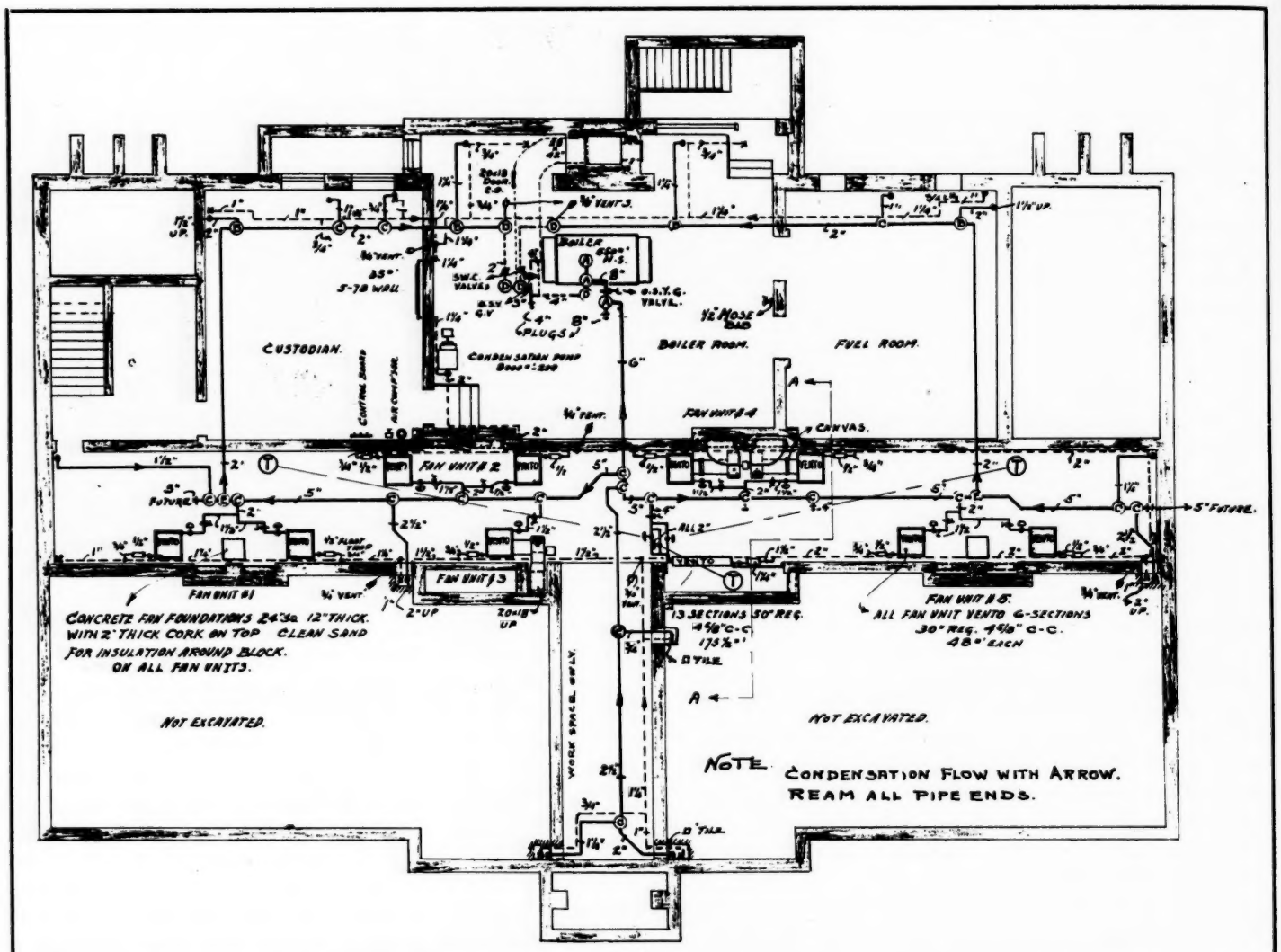
The Requirements:

To satisfy the above demands it is necessary to protect the entire seating area along the windows with radiation, and adopt suitable means to insure an even steam distribution over the entire radiator length, so that no more radiated heat falls on a child near the steam inlet of the radiator than on a child near the opposite end of the same radiator. This procedure eliminates window drafts, even when the wind presses against that face of the building.

To introduce cooler new air at such velocities directed against the ceiling to insure a positive turbulence along the entire ceiling area, this turbulence to be changed into



Ventilation Tunnel, 101 Ft. Long, 10 Ft. Wide and 7 Ft. High


CUSTODIAN.
BOILER ROOM.
FUEL ROOM.
BOILER
CONDENSATION PUMP
FAN UNIT #1
FAN UNIT #2
FAN UNIT #3
FAN UNIT #4
FAN UNIT #5
CANVAS.
CONCRETE FAN FOUNDATIONS 24"sq. 12" THICK. WITH 2" THICK CORK ON TOP CLEAN SAND FOR INSULATION AROUND BLOCK. ON ALL FAN UNITS.
NOT EXCAVATED.
NOT EXCAVATED.
ALL FAN UNIT VENTO 6-SECTIONS 30" REG. 4½" C-C. 48" EACH
13 SECTIONS 30" REG. 4½" C-C. 175½"
WORK SPACE ONLY
NOTE. CONDENSATION FLOW WITH ARROW. REAM ALL PIPE ENDS.
5" FUTURE.
5" FUTURE.

Basement Plan of Allen School

a draftless diffusion within about 7 ft. from the floor but still descending where it gradually meets and absorbs the body heat of the children. The ever-descending column of new air prevents the rising of the vitiated air. Suitable air exhaust openings near the floor convey the used air out of the roof by means of metal ducts.

To warrant a positive ventilating pressure, the window frames, etc., should be fairly tight, and allowance be made for future leakage because of material shrinkage. The air exhaust ducts should be of such size as to remove the vitiated air only and to avoid wastage of good air. Other desirable practical features, such as the avoidance of horizontal dust-gathering air ducts; assurance of operation of the ventilating system on account of its simlicity; custodian's control of the entire mechanical equipment from the basement; practical removal of heavy dust particles without special apparatus which requires attention; easy removal of dust accumulation, and easy access to all piping.

With these practical principles in mind the writer designed for an 8-room grade school building a system, which was intended to retain the best of the central fan and unit-ventilator principles. This building was erected without a bond issue and, therefore, had to be erected for the available amount of money. Provision has been made in air ducts, boiler and pipe sizes, etc., to permit the future addition of eight more rooms and a gymnasium. To accomplish this will require removal of the end walls in the service tunnel and the re-installation of the radiators on corridor ends only.

A low-pressure steel boiler set on a high foundation to permit the installation of an underfeed stoker at a later date provides steam for a direct heating system. A system of steam and return piping was provided with the required steam traps to operate the job on the atmospheric pressure principle. A float-operated condensation pump returns all condensate to the boiler. The automatic temperature control system is split in two, one for direct radiation control and the other for air temperatures. All classroom radiators are equipped with an even heat delivery pipe running through the top nipple connection for the entire length.

The ventilating system consists of an air suction shaft starting above the roof and ending in the service tunnel wherein all piping, fans, motors and heaters are located.

A single row of Vento heats the air to a maximum temperature of 40° F. Entering the large tunnel the air flow changes its direction and this, combined with the reduction in velocity, permits the larger particles of dust to settle on the tunnel floor whence it is removed by hosing. Two sealed floor drains carry the waste to the open floor drains located in the boiler room, which is on a 4-ft. lower level. Blower-type fans draw the air from the tunnel ceiling through reheating Vento stacks from which it

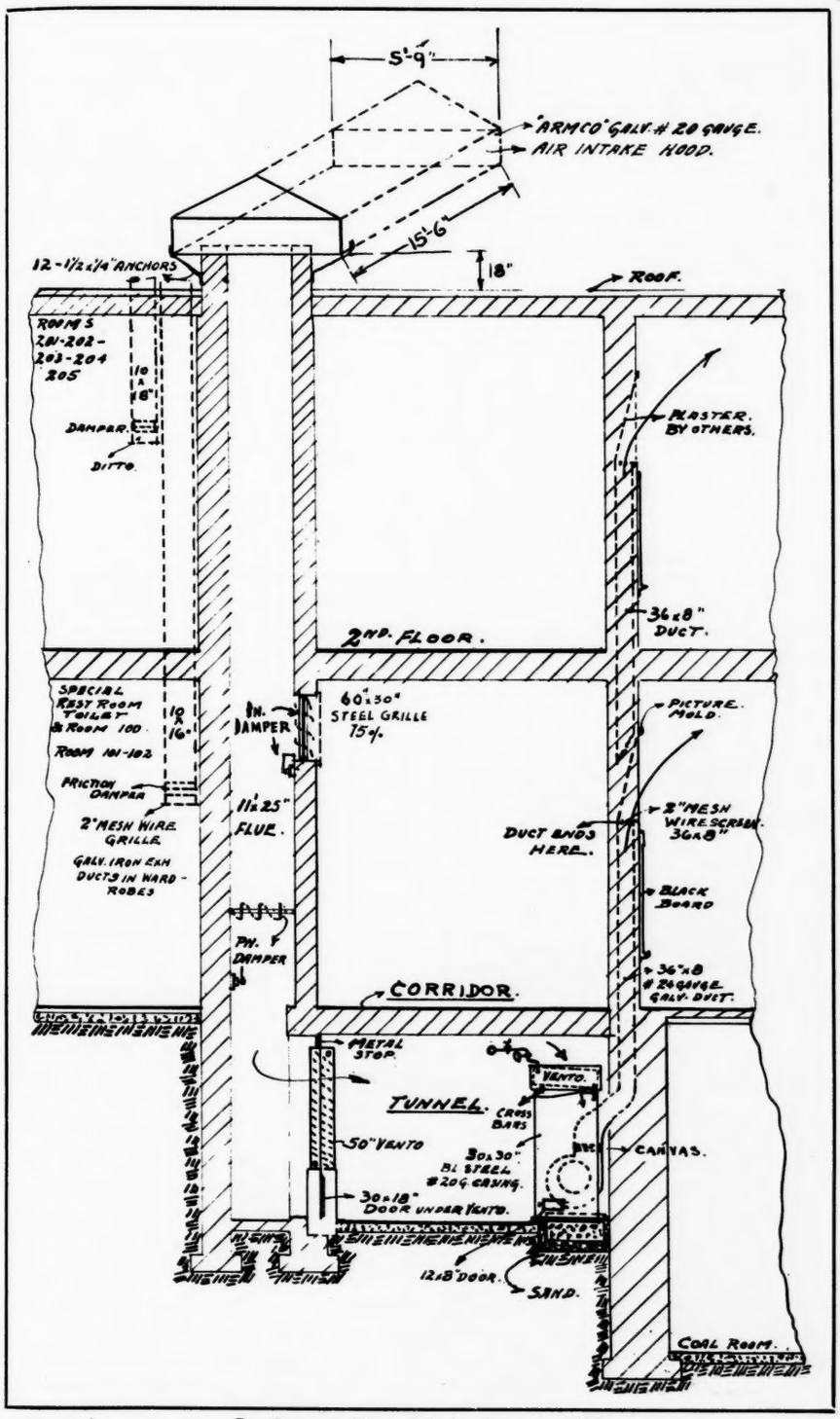
is discharged into a vertical air duct. One motor runs two blowers serving the classrooms located above each other on first and second floors. The service tunnel is 10 ft. wide by 7 ft. high, of ample size, and is constructed entirely of brick and concrete, painted with white oil paint, and well lighted.

Both toilets have exhaust blowers and are operated from the basement.

No attempt has been made to humidify the air as there is still some doubt in the writer's mind of its practical benefits in rooms where the longest continuous occupation is not more than 2 hrs. at one time. As there are few dust-lodging areas exposed to steam temperatures which cannot readily be seen, very little dust carbonization takes place. With oiled linoleum floors in the classrooms, and the horizontal dust-lodging areas on the lower portion of the wall radiators, which practically never reach a dust-splitting temperature, no humidity is needed to keep the dust settled. It it should be found later that humidity is desirable the required equipment can readily be installed.

In a future article we will describe the behavior and results of the installation as experienced this winter, which up until now has been satisfactory.

It would not have been possible to install the described work without the cooperation of the Board of Education of the City of Elyria, O., the school superintendent and the architects, whose assistance is gratefully acknowledged.



Section on Line AA in Basement Plan

Heat Insulators

Special report No. 35 has been published by the Engineering Committee of the Department of Scientific and Industrial Research of Great Britain as part of the series on food investigation. The report deals with insulating materials used in the construction of refrigerators and coal-storage structures, and is of special interest as it is concerned with many unusual materials.

In connection with the tests on slab cork, a sample of this material was tested after it had been in use in the refrigerating room of a warship for ten years. It was found that the value obtained for the thermal conductivity is a normal one for slab cork of that weight per cubic foot.

Material	B.T.U. per hr. per °F. diff. per sq. ft. High	Low
Baked Slab Cork	0.26	0.34
Unbaked Slab Cork	0.29	0.36
Granulated Cork, very fine	0.29	....
Granulated Cork, coarse	0.31	0.37
Charcoal	0.31	0.38
Eucalyptus Fiber	0.31	0.37
Cellular Paper Bricks	0.65	0.82
Diatomaceous Earth	0.56	0.66
Cork Cement Aggregate	0.39	....
Slag Wool	0.29	0.41
Jangada Wood	0.46	0.83
Eel Grass	0.31	0.34
Cane Fiber Material	0.42	....
Concrete Slab	8.1	8.4

The tables give the thermal conductivities in both C.G.S. units and in B.T.U. The cold face, hot face and mean temperatures are tabulated both in degree centigrade and degree Fahrenheit. A summary of some of the results are presented above.

Published as special report No. 35 of the Food Investigation Series by the Department of Scientific and Industrial Research, it can be obtained from the British Library of Information, 5 E. 45th St., New York. Size 6 in. x 9¾ in. Pp. 96. Price 65c.

Estimating and Designing Heating Systems

Part III—Overhead Feed Hot Water Systems

by **FRED W. HANBURGER**

Special Lecturer on Heating and Ventilation, College of the City of New York

WHEN two-pipe cellar mains are used and each radiator creates its own power, the throttling necessary for the proper flow to the upper radiators reduces the size of the risers to these radiators rapidly. Where the radiation for a third floor room is not excessive the riser size generally reduces to ½ in., and this is always true for a fourth floor. The friction loss in this smaller pipe is so large that the results become more or less uncertain.

Consequently, for a building over three stories in height it is wise to use the overhead feed especially if the upper radiators are fed by the same risers as those on the lower floors. In a design of this nature each riser with all of its radiators must be considered as a single generating unit.

An overhead main installation is shown in Fig. 8, with three risers AA′, BB′ and CC′. The sub-riser PP′ can be considered as part of riser CC′.

While each radiator on a riser is cooling a portion of the water, and therefore exerting a force towards circulation, its force is added to that of other radiators on that riser. For the same amount of radiation, an upper radiator, with its greater height, will contribute a larger percentage of the total force than one of the lower radiators.

The simplest way to determine the generating power of a riser as a whole is, first, to find the average generating height. This is done by multiplying the working height of each radiator by its radiating capacity and then dividing the sum of these by the total radiating capacity on the riser. Thus, for riser AA′, the average height is calculated as follows:

30,000 B.T.U. per hr.	x 42 ft.	=	1,260,000 B.T.U.–ft./hr.
25,000 B.T.U. per hr.	x 33 ft.	=	825,000 B.T.U.–ft./hr.
20,000 B.T.U. per hr.	x 24 ft.	=	480,000 B.T.U.–ft./hr.
15,000 B.T.U. per hr.	x 15 ft.	=	225,000 B.T.U.–ft./hr.
10,000 B.T.U. per hr.	x 6 ft.	=	60,000 B.T.U.–ft./hr.
100,000 B.T.U. per hr.		=	2,850,000 B.T.U.–ft./hr.

so that

$$\frac{\text{2,850,000 B.T.U.–ft./hr.}}{\text{100,000 B.T.U./hr.}} = \text{28.5 ft. average height.}$$

For riser BB′, omitting the ciphers in the calculation, the average height is 19.5 ft., and for riser CC′, including the sub-riser PP′, the average height is 20.14 ft. For riser CC′, had it not been for the sub-riser, the average height would have been exactly one-half the actual height owing to the equal amount of radiation in each riser.

An installation of this kind may be designed for a drop in temperature of 40° or 50°. In preceding examples the drop was limited, owing to the fact that in such systems the main throttling becomes concentrated at one point, generally in the highest radiator branch and when too great a drop is used, a pipe less than ½ in. in diameter is indicated. This is too small for good practice. In the overhead system the throttling can be more widely distributed.

Taking a drop of 40° for our basis, and referring to Table I, Lesson 2, published in last month's issue, we find that the pressure developed per foot of height between a column of water at 190° and one at 150° is (61.203 — 60.365) lbs. per sq. ft. per ft. = 0.84 lbs. per sq. ft. per ft., and the power developed by riser AA′ is 28.5 ft. x 0.84 lbs. per sq. ft. per ft. = 23.94 lbs. per sq. ft.

Similarly, for riser BB′ it is 16.38 lbs. per sq. ft., and for riser CC′, 16.82 per sq. ft.

To arrive at a tentative size for the pipe the least favored riser can be used. Taking riser CC′, we have an actual length of 360 ft., and with an allowance of about 60% for fittings we have about 600 ft. of equivalent length. This gives

$$\frac{\text{16.82 lbs. per sq. ft.}}{\text{600 ft.}} = \text{0.031 lbs. per sq. ft. per ft. friction loss.}$$

The amount of water needed per hour for each radiator is obtained by dividing its heating capacity in B.T.U. per hour by 40.

Referring to the flow chart Fig. 5, Lesson 2, a pipe somewhat larger than 3 in. diameter is indicated for the mains leaving the boiler, and over 2 in. for the riser CC′.

At this stage it is well to give consideration to the other risers. In this case riser AA′, situated close to the boiler and with a high generating force, may need undue throttling and riser BB′ slightly less, so that if the mains from the boiler to A

and from A′ to the boiler are restricted slightly the friction loss to A and A′ will be increased, and the throttling necessary for riser AA′ can be reduced.

Similarly, a liberal sizing of the mains from A to C and from A′ to C′ will allow for a greater throttling in riser CC′. In this way the riser CC′ can be reduced to a 2 in. pipe rather than an undesirable larger size, and the riser AA′ can be brought up to a size nearly the same, resulting in better appearance. For this reason it is best then to adopt 3 in. mains from the boiler.

From this stage, in installations of this kind, the designer has considerable leeway in combinations of piping possible, all being correct if the friction balance is maintained. The steps used in this case are given in detail as follows.

We have, using 3 in. mains from the boiler, a friction loss to A as follows:

Actual length of pipe from boiler to A	= 88 ft.
Fitting allowance	= 30 ft.
Equivalent length	=118 ft.

Friction loss = 118 ft. x 0.043 lbs. per sq. ft. per ft. (from the chart) = 5.074 lbs. per sq. ft., while the friction loss to A′ is 1.892 lbs. per sq. ft. These losses and others following are underlined in Fig. 8.

A 3-in. pipe is assumed from A to B and from A′ to B′. The frictional loss in each is that for 60 ft. of actual pipe plus 6 ft. allowance for the T fitting, or 66 ft. of equivalent pipe giving 66 ft. x 0.016 lbs. per sq. ft. per ft. (for 3600 lbs.) = 1.056 lbs. per sq. ft. loss.

The total loss along the flow main to point B is then 5.074 lbs. per sq. ft. + 1.056 lbs. per sq. ft. = 2.948 lbs. per sq. ft.

Size of riser BB′ can now be determined. From previous calculations it is evident that riser BB′ will probably be of 2-in. pipe. Using this size, the friction is as follows:

Actual height	= 52 ft.
Fitting allowance (for 10 tees)	= 40 ft.
Total	= 92 ft.

so that 92 ft. x 0.06 lbs. per sq. ft. per ft. (for 2500 lbs.) = 5.52 lbs. per sq. ft.

Total friction through this circuit is: (6.130 + 5.52 + 2.948) lbs. per sq. ft. = 14.598 lbs. per sq. ft. as against 16.38 lbs. per sq. ft. available. This leaves a friction loss of 1.782 lbs. per sq. ft. yet to be introduced.

This can be done by reducing part of the mains from 3 in. to 2½ in. The friction loss for 3600 lbs. of water flowing per hour through a 2½-in. pipe is 0.04 lbs. per sq. ft. per ft. and through a 3-in. pipe is 0.016 lbs. per sq. ft. per ft. Therefore, for each foot of 2½-in. pipe substituted for 3-in. there is additional friction loss of (0.04 — 0.016) lbs. per sq. ft. per ft. = 0.024 lbs. per sq. ft. per ft. To obtain 1.782 lbs. per sq. ft. loss we require 75 ft. of 2½-in. pipe to be substituted.

Allowing for the use of reducers and the extra friction resulting from use of smaller T fittings, the actual length would reduce to about 62 ft. This can be accomplished by using 2½-in. pipe in the entire section A′B′ of the return main and reducing in the flow line as shown at S on the plan.

A check calculation of friction loss to point B shows:

3-in. pipe 58 ft. x 0.016 lbs. per sq. ft. per ft. = 0.928 lbs. per sq. ft.

2½-in. pipe 12 ft. x 0.04 lbs. per sq. ft. per ft. = 0.48 lbs. per sq. ft.

Total friction loss in AB = 1.408 lbs. per sq. ft.

The total friction loss from the boiler to B is now (5.074 + 1.408) lbs. per sq. ft. = 6.482 lbs. per sq. ft.

For the return there is a friction loss to B′ of 4.492 lbs. per sq. ft. This is marked on the plan. A trial of the circuit through BB′ shows a friction loss of (6.482+5.52+4.492) lbs. per sq. ft. = 16.49 lbs. per sq. ft., as compared with 16.38 lbs. per sq. ft., the generating force. This is even closer than is absolutely necessary.

To size the riser CC′ the pipe from B to C and from C′ to B′ can be considered with the riser. The total friction already determined for the circuit is that from the boiler to B and from the boiler to B′ which is (6.482 + 4.492) lbs. per sq. ft. = 11.974 lbs. per sq. ft., so that (16.82 — 11.974) lbs. per sq. ft. = 4.846 lbs. per sq. ft. is available for the balance of the circuit.

A rough estimation of the length of this balance of the circuit is (52+30+30) ft. or 112 ft., which, with an allowance for fittings, gives

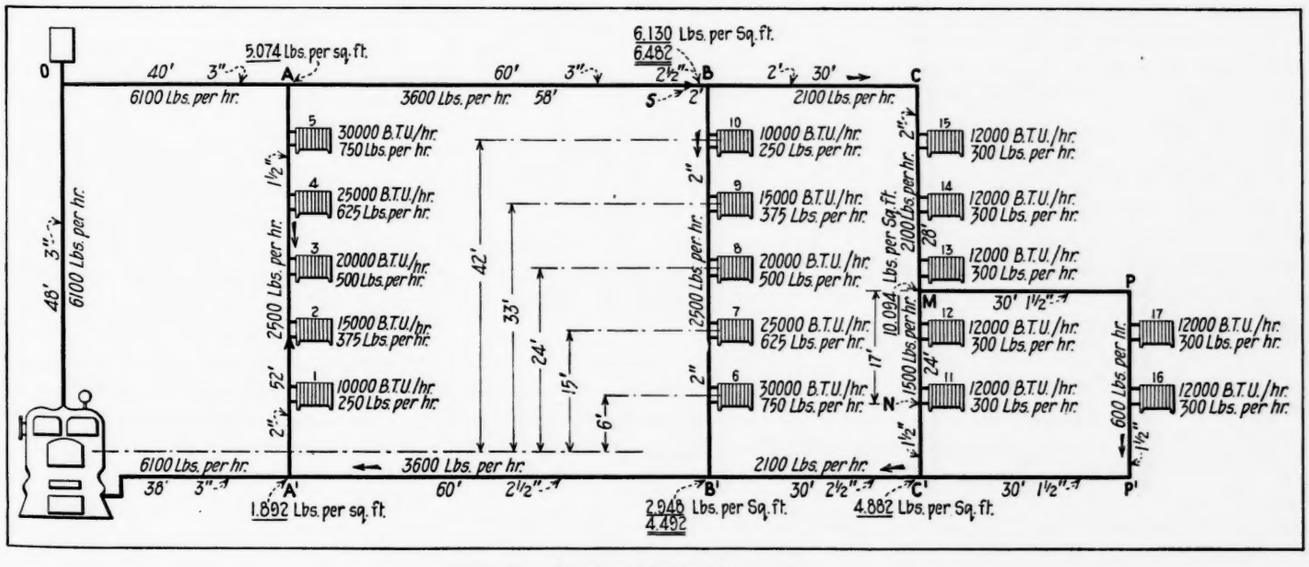


Fig. 8. Overhead Main Water System

about 140 ft. of equivalent length. This results in

$$\frac{\text{4.846 lbs. per sq. ft.}}{\text{40 ft.}} = \text{0.03 lbs. per sq. ft.}$$

as the permissible loss per linear ft. Referring to the flow chart, Fig. 5, the following sizes are indicated:

BM = 2 in.
MC′ = 2 in. and 1½ in.
PP′ = 1¼ in.

The loss from B to M will be 3.612 lbs. per sq. ft., making the total loss through the flow main from the boiler to M equal to 10.094 lbs. per sq. ft. as shown on the plan.

Probably the shortest method of determining pipe sizes for the remaining part of the circuit is to determine the unit friction loss for the various sizes as a guide. The chart shows that these will be:

1500 lbs. through 1½-in. pipe = 0.095 lbs. per sq. ft.
1500 lbs. through 2-in. pipe = 0.021 lbs. per sq. ft.
2100 lbs. through 2-in. pipe = 0.042 lbs. per sq. ft.
2100 lbs. through 2½-in. pipe = 0.013 lbs. per sq. ft.

It is now evident that, with an equivalent length of nearly 100 ft. and only slightly more than 2 lbs. per sq. ft. of pressure to spare, to use all 1½-in. pipe would result in too much friction. Even by using 2-in. pipe the friction would still be too great so that a 2½-in. pipe is used from B′ to C′. This gives a total friction loss in the return main from C′ to the boiler of 4.882 lbs. per sq. ft.

This leaves [16.82 lbs. per sq. ft. — (10.094 + 4.882) lbs. per sq. ft.] = 1.844 lbs. per sq. ft. still available. With an equivalent length of about 40 ft., and referring to the friction loss for 1½ in. and 2 in. pipe, we find that about two-thirds of the length must be of 2-in. pipe. Using a 2-in. pipe from M to the outlet from the first floor radiation N, a distance of 17 ft., and a 1½-in. pipe from N to C′ (7 ft.), the equivalent length is found to be

MN (17+16) ft. = 33 ft.
NC′ (7 + 3) ft. = 10 ft.

For the quantities flowing, referring to the flow chart, our friction loss in MN for 33 ft. is 33 ft. x 0.021 lbs. per sq. ft. per ft. = 0.693 lbs. per sq. ft. For NC′ we have 10 ft. x 0.095 lbs. per sq. ft. per ft. = 0.95 lbs per sq. ft. The total is 1.64 lbs. per sq. ft., as compared with 1.844 lbs. per sq. ft. available. The total friction for the whole circuit is 10.62 lbs. per sq. ft., within 1% of the available 10.82 lbs. per sq. ft.

In the sub-riser PP′ the same amount of friction (1.84 lbs. per sq. ft.) must be built up through the pipes MP, PP′, and P′C′. It can be verified that this will amount to 1.6 lbs. per sq. ft. by using a 1½-in. pipe.

Riser AA′ is taken care of in a similar manner. The sum of the friction losses from boiler to A and from A′ to boiler is 6.966 lbs. per sq. ft., while the energy generated is 23.94 lbs. per sq. ft., so that the friction in the riser should equal (23.94 — 6.966) lbs. per sq. ft. = 16.974 lbs. per sq. ft. The student can determine that this will require 34 ft. of 1½-in. and 18 ft. of 2-in. pipe.

While the 2-in. pipe is laid out from radiator No. 2 to the return main, it need not necessarily be placed there, but could be inserted anywhere in the riser. The only considerations are appearance and the fact that this amount of the larger pipe must be used.

In overhead systems the water entering each radiator has a lower temperature as it descends in the riser, and provision for this must be made in the amount of radiating surface allowed. With the system designed for a temperature drop of 40°, with the final temperature in the return at 150°, the mean temperature of the water in the lowest radiator will be considerably below the latter figure. This is illustrated in Fig. 9 which shows the temperature of the water at various points in riser AA′. As the amount of radiating surface is dependent on the difference in temperature between that of the water flowing and the room temperature, it will be seen that more radiating surface is required for the lower radiators. This will be discussed in a later lesson. The method of determining the water temperature is as follows:

Thirty per cent of the total amount of water enters radiator No. 5 $\left(\frac{\text{750 lbs.}}{\text{2250 lbs.}}\right)$ and we have previously determined a drop of 40° in temperature. The temperature drop in the total amount of water flowing through the riser is 30% of 40° or 12°, so that the temperature in the riser immediately below radiator No. 5 is 190° — 12° or 178°, the temperature at which it enters radiator No. 4 (ignoring heat loss from the riser itself).

Twenty-five per cent of the total water $\left(\frac{\text{625 lbs.}}{\text{2500 lbs.}}\right)$ enters radiator No. 4 at 178° and drops 40°, so that the temperature drop in the total amount of water will be 25% of 40°, or 10°. The temperature of the water entering radiator No. 3 is 178° — 10° or 168°. Similar calculations are made for each radiator. Leaving the calculations for radiators No. 3 and No. 2 to the reader, and taking radiator No. 1, we have 10% of the water entering this radiator at 154°. With a drop of 40° to 114°, the average temperature in this radiator on which the allowance for radiation must be based is 134°.

It should be noted that with 10% of the water dropping to 40° temperature in radiator No. 1, the drop for the total water flowing through the system will be 10% of 40°, or 4°. The return water will then be at 154° — 4° or 150°, the temperature designed for checking our calculations.

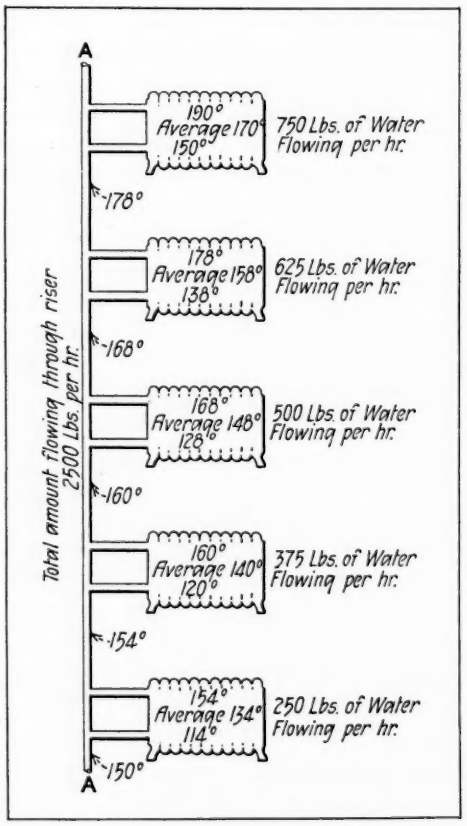


Fig. 9. Temperature of Water at Various Points, Riser AA

The size of the radiator branches and connections are determined by many designers by equalization. Absolute precision is not so important due to the compensating nature of hot water systems, yet the sizes of these connections are best determined by the same method of friction pressure loss as used in the design of the mains. The vertical distance between the inlet and outlet connections is taken as the generating head and the pipe sizes chosen to make the friction equal to this amount.

Considering radiator No. 5 in Fig. 8 as an example, and assuming a 38-in. radiator, the distance between the inlet and outlet is approximately 2½ ft., which gives an allowance for friction of 2.5 ft. x 0.84 lbs. per sq. ft. per ft. = 2.1 lbs. per sq. ft., and allowing for outlet, valve and fitting resistance we have about 30 ft. equivalent length of pipe. This gives a frictional allowance of

$$\frac{\text{2.1 lbs. per sq. ft.}}{\text{30 ft.}} = \text{0.07 lbs.}$$

per sq. ft. per ft.

Referring to the flow chart using this value and for 750 lbs. per hr., a 1¼-in. pipe is indicated and should be used for the radiator connections to radiator No. 5. Others are determined similarly.

Theoretically, the riser between the inlet and outlet should be throttled so that its friction for 70% of the water would be equal to that for 30% of the water flowing through the radiator, but the small precision gained does not justify the cost or unsightly appearance of a multitude of fittings.

Following are the solution to the problems which appeared in Lesson 1, in HEATING AND VENTILATING for November, 1929.

Problem 1. A client comes to you for advice saying that he is intending to open a factory in a building situated 250 ft. from the city supply main and the building is serviced with a 1¼-in. tap and service pipe. His cellar faucet is at the same level as the city main and there are times when he will need a supply of 150 gals. per min. from this faucet. The gauge pressure on the city main is 50 lbs. per sq. in. Is the 1¼-in. supply pipe large enough to supply this amount? If not, what size pipe would you suggest?

Answer. The 1¼-in. pipe is too small. With 50 lbs. per sq. ft. pressure available for friction, 250 ft. of 1¼-in. pipe allows only 20 lbs. per sq. ft. loss for each 100 ft. of length. Referring to the chart in Fig. 3, it will be noted that the friction loss in a 1¼-in. pipe for 150 gals. is over 100 lbs. per sq. in. per 100 ft., and 1¼-in. pipe is therefore too small, as is also a 1½-in. pipe.

The loss through a 2-in. pipe is indicated as 18 lbs. per sq. in. per 100 ft. and this allows 2 lbs. per sq. in. for velocity head. From the chart the velocity is found to be 15 ft. per second and the head would be

$$\frac{(\text{15 ft. per sec.})^2}{\text{64.2 ft. per sec. per sec.}}$$

or 3.3 ft. This is equal to a pressure of

3.3 ft. x 0.434 lbs. per ft.=1.43 lbs.

The total pressure required to deliver 150 gal. per min. through a 2-in. pipe is then

(18 + 1.43) lbs. per sq. in. per 100 ft. = 19.43 lbs. per sq. in. per 100 ft., and as we have 20 lbs. per sq. in per 100 ft. available for this purpose the 2-in. pipe will suffice.

Problem 2. If you have used a different-sized pipe in the preceding problem, then with this new pipe, how high could you hope to obtain water in a building between the supply main and the factory, located directly along this line 160 ft. from the supply main?

Answer. Using a 2-in. pipe, the friction consumed to the riser 160 ft. from the main would be

18 lbs. per sq. in. per 100 ft. x 1.60 hundred ft. = 28.8 lbs. per sq. in. and the pressure remaining would be

50 lbs. per sq. in. — 28.8 lbs. per sq. in. = 21.2 lbs. per sq. in., which would cause the water to rise in the riser a distance of

21.2 lbs. per sq. in. x 2.3 ft. per lb. per sq. in. = 48.76 ft.

Problem 3. If a pump is delivering 90 gals. of water per min. through a 1½-in. pipe, 260 ft. long, to a roof tank 90 ft. vertically above the pump, what will be the pressure per square inch on the piston in the water end of the pump?

Answer. The pump must have a pressure sufficient to maintain a static head of 90 ft., the friction head and the velocity head. The static head is

90 ft. x 0.434 lbs. per sq. in. per ft. = 39.06 lbs. per sq. in.

The chart of Fig. 3 gives a friction loss of 22 lbs. per sq. in. per 100 ft. of length (for 90 gals. per min.), so that the friction head will then be

22 lbs. per sq. in. per 100 ft. x 2.60 hundred feet = 57.6 lbs. per sq. in.

As the velocity is 14 ft. per sec. the velocity head is

$$\frac{(\text{14 ft. per sec.})^2}{\text{64.4 ft. per sec. per sec.}} \times \text{0.434 lbs.}$$

per sq. in per ft. = 1.3 lbs. per sq. in.

The total head on the pump is therefore

(39.06 + 57.6 + 1.3) lbs. per sq. in. = 97.96 lbs. per sq. in.

Problem 4. What would be the pressure on the piston of the pump if the pump were discharging the same amount of water, through the same size and same length of pipe as in the preceding problem, but with the tank located so that its inlet is on the same level as the pump?

Answer. The pressure on the pump piston is the same as in the preceding problem less that necessary to maintain the 90 ft. column of water. It is therefore

(97.96 — 39.06) lbs. per sq. in. = 58.9 lbs. per sq. in.

The problem for this month, the answer for which will appear in a later issue, is given below.

Problem 5. Prove that the theoretical discharge from a 1-in. opening in a large supply main having a static pressure of 50 lbs. per sq. in. will be 212 gal. per min. Note: First reduce the 50-lb. pressure to head by multiplying by 2.3.

Explanation of Physical Laws

Among the many questions asked by students, the following one is of so much importance to the reader of HEATING AND VENTILATING that I am answering it in detail. A typical letter, in part, follows:

Dear Mr. Hanburger:

I have worked with the tools in the heating and plumbing trades for three years and have been studying and reading to learn the principles, but I often come across an expression that sticks me. It reads

$$H = \frac{V^2}{2g}$$

I know it has reference to the height of the water but I notice that it also is used in problems on air. Is it important, and just what does it mean?

MECHANIC.

Answer: This expression is found in

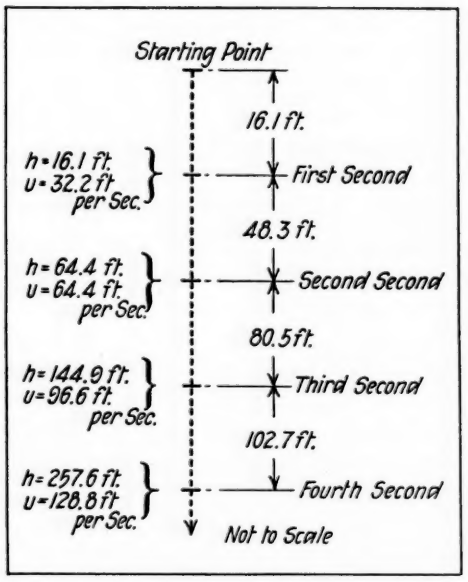


Fig. 10. Illustration of Law of Falling Bodies. Not to Scale.

nearly every hydraulic formula relating to flow, and any one wishing to study the flow of fluids should thoroughly understand it. It is known as the formula for velocity head and represents the head that is necessary to attain a given velocity caused by the attraction of the earth. This attraction of the earth is constant and acts on a body while it is falling just as much as when it is at rest, so that a falling body is constantly increasing its velocity at a uniform rate. This force acts the same on any and all bodies whether it be a drop of water, a stone, a feather from a dove's breast, or a lump of lead, and all will fall with the same rapidity if there is no other force acting against the force of gravity. Falling through the atmosphere the resistance of the air is greater against the feather than against the stone so that the feather falls less rapidly. In a tube with the air removed they will drop side by side. This same law applies to a fluid as well as to a solid body so that if we study it as applied to some solid object, which we can see and observe, we can later apply it to any fluid.

The long vertical line in Fig. 10 represents the path of a freely falling body during a period of 4 sec. of time and the end of each second is marked and numbered. The figure is not drawn to scale as the distance fallen through each succeeding second is greater than that through the preceding one. Now it has been found that a freely falling body gains a velocity of 32.174 ft. for each second that it is falling. This acceleration of gravity is always constant, and is represented by the letter g. For simplicity, the value of g is generally taken as 32.2 ft. per sec. per sec. Thus, if we know the time that a body has been falling we can find its velocity at that moment by multiplying the time by 32.2. At the end of the first second it has a velocity of 32.2 ft. per second, at the end of the second second this is 64.4 ft. per second, etc.

If Babe Ruth catches a ball dropped 5½ seconds before from the roof of one of the large hotels, the ball, when he catches it, will be traveling at the rate of 5½ sec. x 32.2 ft. per sec. per sec. = 161.0 ft. per sec. The first law, then, can be stated as:

$$v = gt \qquad (1)$$

or transposed

$$t = \frac{v}{g} \qquad (2)$$

To obtain the distance fallen in any particular second it is necessary only to find the average velocity in that second. Thus in the first second its starting velocity is zero and its final velocity is 32.2. Its average velocity is then

$$\frac{0 + 32.2 \text{ ft. per sec.}}{2} = 16.1 \text{ ft. per sec.}$$

and this is the distance fallen during the first second. In the second second, with an initial velocity of 32.2 ft. per sec., and a final velocity of 64.4 ft. per sec., the distance fallen in that second is

$$\frac{(32.2 + 64.4) \text{ ft.}}{2} = 48.3 \text{ ft.}$$

And the total distance, h, fallen during the first two sec. must be the sum of the two or

$$(16.1 + 48.3) \text{ ft.} = 64.4 \text{ ft.}$$

The total distance, h, could thus be determined, step by step, for any time, but it would entail considerable work where the time was great, so that it is best to reduce it to formula form. For a period of 4 sec., for example, the initial velocity is zero, the final velocity is

4 sec. x 32.2 ft. per sec. per sec. = 128.8 ft. per sec.

and the average velocity per second throughout the entire 4 sec. must be

$$\frac{(0 + 128.8) \text{ ft. per sec.}}{2} = 64.4 \text{ ft. per sec.}$$

Thus it is traveling at an average rate of 64.4 ft. per sec. for 4 sec. of time and the distance fallen must be

64.4 ft. per sec. x 4 sec. = 257.6 ft.

We can reduce this to formula form by retracing the operation. The average velocity was obtained by multiplying g by t and dividing by 2, expressed $\frac{g \times t}{2}$ and to obtain the total distance this was multiplied by the time, thus

$$\frac{g \times t}{2} \times t$$

which gives the rule

$$h = \frac{g \times t^2}{2}, \text{ or } \frac{g}{2} \times t^2 \qquad (3)$$

Thus if we timed a stone dropping in a well and found that it took 2½ sec. to strike the water, the depth of the well would be

$$\frac{32.2 \text{ ft. per sec. per sec.}}{2} \times (2\tfrac{1}{2} \text{ sec.})^2 = 100.6 \text{ ft.}$$

This same law applies to a fluid, such as water, falling in a pipe but we cannot isolate or see the drop of water to time it as we can a stone or solid object so, to be able to apply the law in hydraulics, it is necessary to eliminate the time element. This is done by taking the value of t in equation (2), which is $\frac{v}{g}$, and substituting it in equation (3), obtaining

$$h = \frac{g}{2} \times \frac{v^2}{g^2},$$

reducing to

$$h = \frac{v^2}{2g}$$

Again transposing we have

$$v = \sqrt{2gh}$$

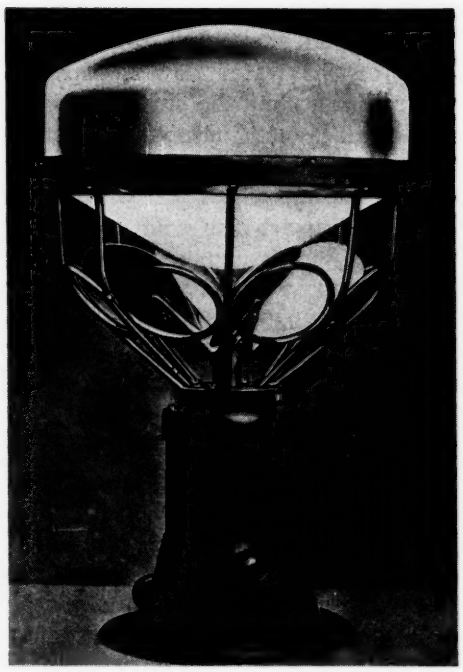
It will make no material difference in our heating problems to take the value of 2g as 64 and the equation then becomes

$$v = 8\sqrt{h} \qquad (4)$$

With equation (4) we can now approach a problem in hydraulics. Thus with a roof tank 144 ft. above the basement, the velocity of flow from an opening in the basement would be $8\sqrt{144} = 96$ ft. per sec. if the riser were large enough not to produce any material friction loss, and the discharge from a 1-in. opening which has an area of 0.0055 sq. ft. will be

0.0055 sq. ft. x 96 ft. per sec. = 0.528 cu. ft. per sec., or 3.96 gal. per sec., 237.6 gal. per min. The actual discharge will be only about 65% of this, due to a contraction of the stream. This will be discussed in a later lesson.

Closed expansion pressure tanks and the errors incident to the use of equalization tables will be discussed in the next lesson.



This New German Lamp Is Equipped with an Electric Ventilator which Cools the Temperature of a Room and Destroys Smoke, Whether It Be from Cigarettes or Defective Flues

Fabricated Fittings—Their Use in Pipe Welding

by **R. E. FRITSCH**

THE necessity for fabricated pipe fittings for pipe welding, such as Tube-Turns, was seen in Germany a number of years ago, and the development of those fittings had a great deal to do with the progress in pipe welding in that country. The advantages offered by welding pipe and the use of Tube-Turns have been used to a wide extent by the Germans, with a result that a large part of their industrial piping is designed with welding in view.

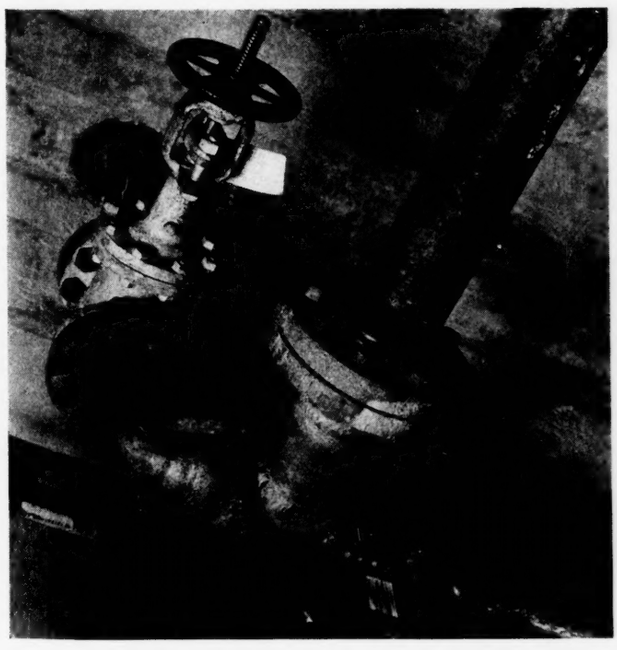
In this country one of the handicaps in the original promotion of pipe welding was found to be the necessary fittings or bends. Contractors naturally objected to the use of long radius pipe bends for various good reasons, included in which were the inability to work in close quarters, and also the fact that bending pipe on the job as a general thing appeared impracticable. Later, mathematical analysis has indicated that on important work for high pressures there may be serious undesirable stresses set up in pipe bends if the true circular section is not maintained throughout. This is a difficult result to produce, especially on the job.

The designer can now calculate with a high degree of exactness, not only the angles of a pipe layout, but also the actual spacing. He can calculate the strength of a piping system because with modern welding practice and control we have a very good idea of the strength of the weld itself, and the material is practically the same in the Tube-Turns as that in the pipe. Therefore the coefficients of expansion may be assumed to be practically uniform throughout as far as the pipe itself and the Tube-Turns are concerned, which means quite a lot to the designer.

Now let us consider the status of pipe welding development. Up to the present we have been more or less pleased when engineers wrote an alternate specification which would permit welding—that left the door open at least. Nevertheless, it was optional with the contractor, and all too frequently he selected the path of least resistance which, to him in many cases, was the old way, that is a threaded and fitted line with which he was familiar. Either the data presented were not sufficient to convince him that he would come out ahead financially on a welded installation, or he did not have equipment or the proper personnel to be sure of the welded job.

Welded lines at this time are practically all iron or steel pipe and the Tube-Turns are of the same material. The future will see now Tube-Turns made from stainless steels where unusual problems of corrosion are present, and copper and aluminum Tube-Turns will also be made available if needed.

Abstracted from a paper read before the annual convention, International Acetylene Association in Chicago, November 13-15, 1929.



Variety of Fittings Reduced by Application of Tube-Turns in Bureau of Standards Power Plant

Offsets in District Heating Mains in Pittsburgh. All except Two Final Welds Were Made on the Ground Above

What is to be the future trend of piping and pipe welding? It is obvious from the most non-technical viewpoint that when a pipe is threaded, some 30% of the wall thickness is removed. In other words, just that much of either the life of the pipe from the corrosion viewpoint or its strength from a stress viewpoint is deliberately removed. Just that much weight of pipe has to be purchased to make a threaded system.

The immediate future may tend toward the use of seamless tubing for which Tube-Turns are already available, but what will happen when careful analysis of the situation is made and it is found that by the use of welded piping with fabricated fittings such as Tube-Turns, a system may be designed with about one-third less wall thickness? Manufacturers of piping may come to this viewpoint and actually turn out pipe which is designed specifically for the purpose intended with the resultant saving in weight and expense.

In that case Tube-Turns of corresponding thickness will be made available at once.

Tube-Turns will always be furnished with a uniform wall thickness equal to that of the pipe in the line so that they will last as long as the pipe and the true full circular cross section of a Tube-Turn without any offsets will offer less resistance to the flow than the present cast fittings.

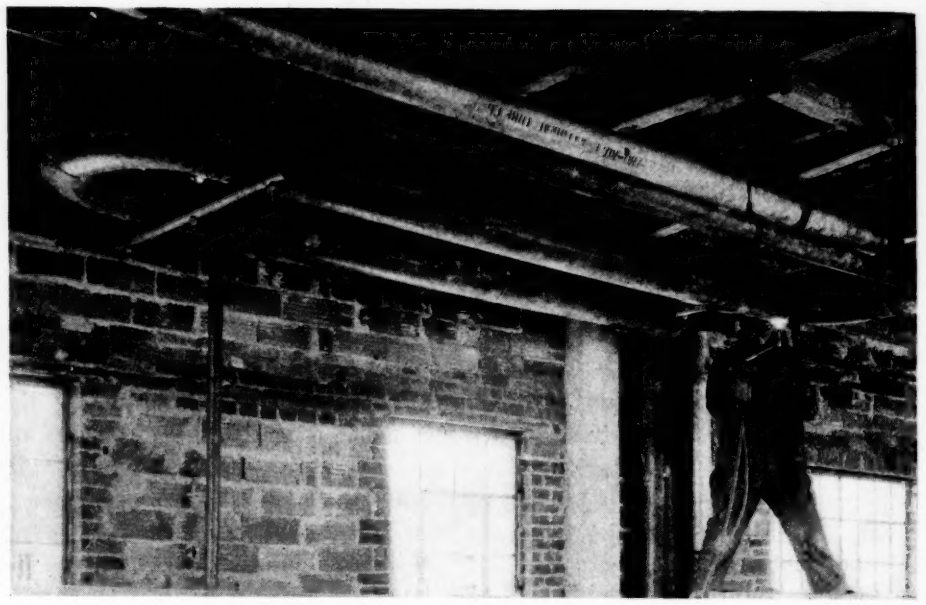
Hangers and supports for the line will be carefully placed but there will be fewer of them than with the threaded line. The reason for this is apparent. For example, a standard radius 4 in. cast-iron flanged elbow designed for 125 lbs. working pressure weighs 76 lbs., including companion flanges, bolts and gaskets —a 4 in. standard weight Tube-Turn weighs 8½ lbs. Therefore the flanged ell is nine times the weight of the fabricated fitting.

Since there are few, if any, flanges to cover in a welded system, the insulation cost is lower in both labor and material because Tube-Turns correspond in diameters and wall to the pipe in the line. After the line is covered it has real beauty without the ugly projections of the flanged covers, which are not only expensive but awkward. Also, the short radius of the Tube-Turn has enabled the piping engineer to follow parallel lines. If there are any odd changes in direction, these are easily cared for by the contractor without any trouble. The cutting torch and a few 180-degree Tube-Turns enable him to make fittings to any number of degrees right on the job.

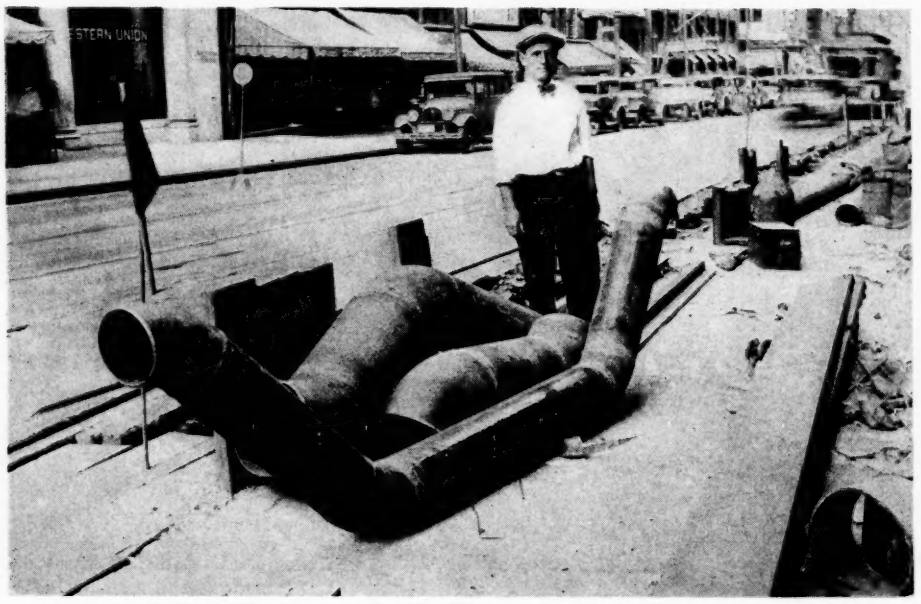
Of course, it is realized that existing standards for pipe cannot be changed over night and for that reason the manufacturers are making a complete line of Tube-Turns corresponding to existing pipe sizes. Since the pipe itself is designed for threaded fittings, the present Tube-Turns are heavier than necessary for the usual stresses to which they may be subjected.

Revision of design to meet current conditions is taking place all along the line as we all realize. The redesign of equipment for welding is relatively new. Special cast flanged fittings for use with pumps and various other equipment are now being redesigned so that they may be welded, using Tube-Turns, forged steel flanges and straight pipe where necessary. The welded fitting is stronger, lighter in weight and often much more economical. In special designs welded fittings can often be produced for less than the cost of the pattern alone from which the casting is to be made.

Thin gauge tubing is now being made and Tube-Turns have been made in similar light wall thickness for special applications.



Expansion Loop in Heating System of Large Apartment Building



Offsets for District Heating System in Pittsburgh Welded Above Ground

What Are the Industry's Five Major Problems?

No Order Without Profit

by A. BACHMAN

Secretary, Heating and Piping Contractors Cincinnati Association

I agree with you on the five major problems, but if I were asked to change the sequence of these problems, I would arrange them as follows:

1. Overhead.
2. Credit.
3. Price Cutting.
4. Estimating burden.
5. New development.

What I have to say will be based on conditions as I see them in Cincinnati, and will concern only problem No. 1, "Overhead" and will be confined to just one phase of this problem "Owner's Salary."

Volumes have been written on "Overhead," and I am sure that any member of the National Heating Secretaries Conference, over which I have the honor of presiding, could use all the available space in several issues of your magazine and then not fully cover the subject, and could do it much better than I.

Any man entering the heating contracting field today has courage and I am sure that the members of my association are above the average. All my members know what "Overhead" is and what items make it up, but I am amazed at the salaries some are willing to accept as a fair compensation for their services as "Owners."

Our city can rightfully be termed a "Closed Union City" so far as new construction is concerned. Almost 80% of our members have graduated from the ranks of the journeymen, being the cream of the membership during the time they were journeymen. All these men know what it is to put in eight hours for a day's work, until such time as they become master steamfitters, when they are willing to work any number of hours and, in most cases, for less than the regular wages of a journeyman, to say nothing of overtime. We have college graduates who are making the same mistake.

Human nature runs very much the same all over the world and I am sure that this is a mistake of the head and not of the heart. Every heating contractor that does this feels that it will only be for a short while until he gets on his feet financially. He overlooks the fact that he is setting a poor example for the man who follows, as well as making it hard for his competitors.

If the master steamfitter owns the building from which he does his business, we tell him that he should charge rent on the basis of what the same accommodations would cost him from some other landlord. By the same token, then, why should he not pay himself at least the same wages he would have to pay another employee who could perform similar services? He need not necessarily take the money out of his business.

A man is to be admired for his thrift and with vision enough to see the importance of a properly-financed business, so that he can discount all his bills. However, I have frequently noticed, where the salary has not been taken out of the business regularly, that the family has not lived up to the standard it should; also, the fact that there was money in the business to pay bills would often make the owner careless in rendering his bills and making collections due him.

A heating contractor preaching Health and Comfort to be obtained through radiator heating, should practice what he preaches and his family should live up to present-day standards, and this he cannot do unless his compensation for services rendered is ample and just to himself and his competitors. The industry which produces our livelihood should be our first consideration and no move to the detriment of this industry should ever be made, even at the sacrifice of personal desires.

"Overhead" undoubtedly is the major problem in our industry and the "Owner's Salary" the first question to be settled in this problem. Above all things be sure that you know what your "Overhead" is and then have the courage to apply it, remembering that an order taken without profit means not only failure to yourself, but that you are keeping an honorable competitor from receiving proper compensation for his services.

An excellent New Year's Resolution: *"No Order to be Taken Without Profit."*

Unethical Practices

by W. M. COSGROVE

Vice-president, American Radiator Company

The present need appears to be a united front on the part of every one connected with the industry, to eliminate unethical practices.

"The laborer is worthy of his hire" is a philosophy handed down through the centuries, and every one in this industry — contractor, wholesaler, and manufacturer — is entitled to make a reasonable profit.

The seller should attempt to make his profit in selling, and not sell at cost or a little above, and then attempt to make his profit in his buying, at the expense of labor, or indulging in the unethical practice of cheapening the quality of the product, or its installation.

Competition cannot be eliminated, but dishonest competition can and must be eliminated if this industry is to endure.

The unwillingness on the part of every one worth while in the industry to do business with or compete against those engaged in unethical practices, or who encourage them on the part of others will, in the course of a short time, bring about the en-

dorsement of "public opinion" to a point where those who indulge in them will either be forced to discontinue them, or automatically eliminate themselves from the industry.

Serving and Selling vs. Estimating and Buying

by **RALPH T. COE**

The R. T. Coe Companies, Rochester, N. Y.

The larger manufacturers seem to have analyzed their largest "bugbears" and have taken many cooperative steps to combat them.

While the contractors are putting forward "Certified Heat," trying central "take-off" bureaus, establishing standardized cost-accounting systems, etc., all intended for the common good, I have noted very little improvement in the mental attitude of "the trade" . . . .

With some outstanding exceptions (which are said to prove the rule) the heating contracting business has changed in the past quarter-century from "serving and selling" units, into "estimating and buying" offices. There has been nothing revolutionary in the process; it has evolved with the changing times, and its effect has been subtle and, by the same token, hard to cope with.

For example: The owner of a home, the head of a corporation, or an architect, used to call in the contractor in whom he had the most confidence, *tell the contractor* what results he wanted to accomplish, and *take the contractor's advice* as to the make of apparatus, type of system, etc., just as he selected his tailor and together picked the kind of material, depending upon how much he wanted to invest.

The contractor knew the merits of each type of apparatus, its intrinsic value, and comparative cost; recommended the highest quality, and, in the event of its coming within the purchaser's ability to pay, bought and paid a *fair* price for the apparatus or materials, and collected his profit.

Today there seems to be a mad scramble to get "listed" in the telephone directory and on the architects' "list of bidders," with the result that estimating costs have greatly added to the contractor's overhead. Due to advertising and manufacturers' sales aggression, the owner or architect selects and specifies makes of apparatus or types of systems and the "tendency" is for the estimator to figure upon the cheapest he thinks they can get by with, all with the idea of getting below his competitor, and landing the job. Upon securing the contract, the shopping begins, in order to show a profit. In many cases the job suffers and it is questionable whether the ultimate user gets what he expected in the way of service.

It is impossible to write a "serial story" and the four other major problems can be more ably dealt with by others more intimately connected with the industry. From the viewpoint of a distributor of highest grade heating and ventilating apparatus (and not from the side line) it seems the *major* problem for the contractor is getting back to "serving and selling." Putting his personality and prestige to work on "prospects for business," rather than chances to estimate . . . . This would allow less time to worry about rotten business conditions, save a lot of estimating time, reduce overhead and make *better* business.

Proposed Heating Board of Trade Will Hold Key to Situation

by **JOHN G. EADIE**

of the consulting engineering firm of Eadie, Freund and Campbell, New York

The heating and ventilating industry's five major problems have been very ably discussed in the columns of your paper. Many of them are of long standing and, while they may vary in intensity with changing business cycles, they are potentially always present.

Much has been done by many trade organizations to mitigate business and trade difficulties and they have, at least, served the purpose of bringing these problems out into the open where they can be sized up and their true nature ascertained. Many of these organizations, however, are made up of people standing on the same side of the problem. The success which has attended the work of the New York Building Congress, made up of all factors of the building trade, and the Electrical Board of Trade and the Steel Board of Trade in New York is so striking as to point the way to the right method of solving such problems.

I believe the board of trade proposed for the heating and ventilating industry in New York holds out high hopes of providing the common ground where those on both sides, or all sides of a problem can get together and frankly face it and, by common consent, arrive at a solution.

Standardized House-Heating Plants as Solution of Marketing Problem

by **M. J. GIBBONS, Jr.**

M. J. Gibbons Supply Company, Dayton, O.

The five major problems in the residential steam vapor and water heating industry are those caused by the absolute failure on the part of the men in the industry to consider a sound economic policy in marketing their products.

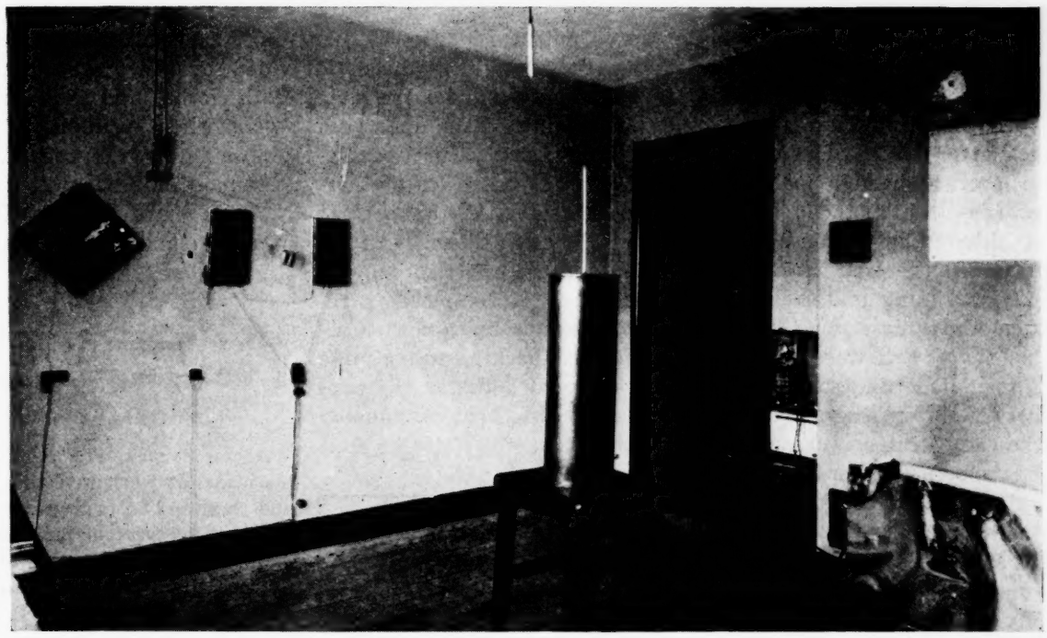
1. Standard Plants for Every Size Home.

In this day of quantity production ready-made products of every kind, such as automobiles, radios, furniture, food, clothing and equipment for every human requirement, including household furniture and even refrigeration, a supply of standardized, ready-made house-heating plants should be available at reasonable prices *without having to give the impression that every plant must be made to order* with all the *high-price ideas* that are associated with special made-to-order products.

2. Money Provided for Salesmen to Sell the Plants, with a Reasonable Profit to the Contractor.

Some intelligence should be displayed in marketing heating systems by providing an *additional overhead* charge of at least 20% margin to the present retail price to cover the expense of salesmen pushing the sale of heating systems to home-owners. The selling price should give at least 10% net profit to the contractor.

(*Continued on Page* 96)



Interior of Experimental House, Showing the "Dummy," a Black Painted Copper Cylinder

Testing Heating Conditions with a Dummy Man

by **A. C. BLACKALL**

WITHIN the walls of a house at Garston, England, a dummy man of particularly delicate constitution is being made the victim of extreme vicissitudes of temperature. He is the subject of tests which, it is hoped, eventually will add comforts for all house-dwellers.*

This dummy is the solitary occupant of a house of the villa type attached to the Building Research Station of the Department of Scientific and Industrial Research. He has been fashioned by the government's housing experts to assist them in comprehensive tests they are making to discover how the occupant of a room is affected by changes of temperature.

No human being is more susceptible to drafts and chills than this research dummy, for his body is a copper cylinder and delicate recording instruments form his limbs. His delicacy of response to atmospheric variations is employed as an automatic control of the heating arrangements of his home. By an ingenious device the dummy is made to operate electric heaters in the room he occupies by means of special relays, controlled by automatic mercury switches. A wind from the east immediately makes the dummy warm the room, so that he may not be chilly.

In order to obtain reliable scientific data on these lines and kindred subjects, the experimental house in which the dummy "lives" was erected at Garston. Exact observations can be made in conditions closely resembling those of the interior of a small semi-detached house. There are four rooms, and on three sides the walls can be removed, for they are fitted into a steel constructional frame.

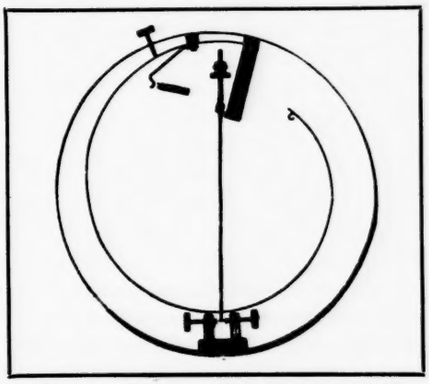


Fig. 1. Thermostatic Device Inside Dummy Man

At the present time the walls are made of brick, set in lime mortar, but later they will be constructed of concrete, wood, and possibly of steel.

A thermostatic device is inside the cylinder. It comprises a bimetallic strip, one end of which is attached to a light helical spring by a phosphor-bronze ribbon which serves to actuate a pivoted lever. (Fig. 1.) The lever moves between two stops, at each of which it makes electrical contact and controls the operation of a relay. The temperature of operation, determined by means of a thermocouple soldered to the cylinder, can be adjusted by a screw which bears upon the strip.

By means of a ballast resistance, the 20 watts dissipated inside the cylinder can be maintained within 1% over a period of several months, despite a 10% voltage variation.

The instrument is sensitive to surrounding objects, to drafts and to sunshine. It is an automaton, with no power of accommodation by vasoconstriction or other means, which "keeps comfortable" by closely regu-

*A description of the experimental house and of the room containing the "dummy man" appeared in The Heating and Ventilating Magazine for May, 1929.

lating the heating of the room.

In commenting upon the investigation undertaken by the Department of Scientific and Industrial Research at the Heating Research Residence at Watford, A. F. Dufton and Dr. Margaret Fishenden make the comment that two methods of measurement hitherto have been applied in determined the heat transmission through building materials. In the first method, described by Barker, 10 sq. ft. of wall were covered with an insulated box and heat was supplied to maintain the air in the box at the same temperature as that in the room. This method, states the authors, is inaccurate unless the temperature of the covered and uncovered surfaces are the same.

In the second method, devised by Percy Nicholls, and used at the Research Laboratory of the A.S.H.V.E., the heat transmission is deduced from the temperature gradient in a layer of material applied to 4 sq. ft. of the surface of the wall. In the opinion of the authors, this method has the disadvantage that the added resistance and changed nature of the surface affect the flow of heat.

The authors then described a new method which has been devised by Mr. Dufton in which the flow of heat is determined by applying to 1 sq. ft. of the surface an electrically-heated plate backed with cork (Fig. 2) and measuring the power required to maintain the surface under the plate at the temperature of the uncovered surface. This temperature regulation is effected by a system of thermocouples embedded in the surface of the wall, in conjunction with relays controlling the electrical supply. Power supplied to the plate is recorded and thermocouples with junctions in the cork backing to the plate add to the recorded power the contribution due to heat conducted through the cork.

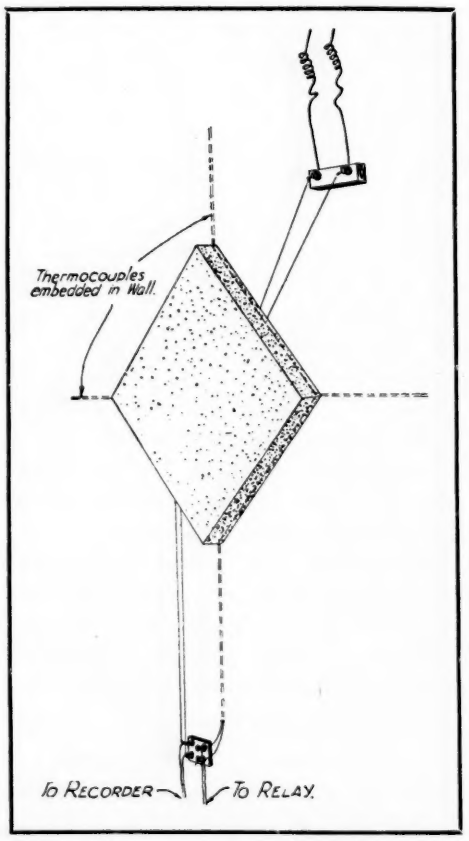


Fig. 2. Measurement of Heat Transmission Through a Wall

What Are the Industry's Five Major Problems?

(*Continued from Page* 94)

3. United Action by Manufacturers of Raw Materials.

The manufacturers of raw products, such as radiators, boilers, pipe, valves and fittings should aid in the setting up of a sound method for the master steamfitter and plumber and then should see that the marketing is done by them, just as the automobile manufacturer keeps after his distributors of cars.

4. Place Responsibility Where It Belongs and Back It Up.

The master steamfitter and plumber must be recognized as the *real and only true manufacturer* of heating systems since it is they who assemble these units of raw materials into a complete working system. Many incompetent firms at the present time engaged in the retail business would be replaced by more desirable firms if the home owner had this true picture. Too many times the label on the boiler or radiator is supposed to insure a successful plant.

5. Taking Care of the Engineering "Bugaboo."

All the "bugaboo" about engineering should be handled in a manner similar to other progressive industries which have their own exclusive engineering or research departments and do not allow the engineering to be scattered everywhere so that it is too plentiful in a few places and missing entirely elsewhere. Standardized heating plants can be simplified and sold just the same as "ready-made clothing" is sold in sizes for the tall, short, fat, thin or medium —or, as ready-made shoes are provided for every man, woman or child. Both clothes and shoes are certainly two excellent examples of applied engineering, or the use of every day "common horse sense" to industries that are years ahead of the retailing of steam and water heating plants.

"Der Industrielle Wärmeübergang"—Industrial Heat Transfer

Doctor Schack, who is well known for his classical work in radiation of gases and flames, has arranged in a capable manner the various heat transfer formulae that heretofore were scattered through the literature of many countries. This book also contains the derivation of the various formulae and some heretofore unpublished material. Furthermore, it contains critical discussions with regard to the range of applicability of the different formulae.

Heat transfer by conduction, convection, and radiation is treated. It considers constant and variable heat flow, simple and composite walls, parallel flow, cross-flow, and counterflow, heat transfer from condensing vapors; recuperators and regenerators, luminous and non-luminous flames, heat transfer in boilers, radiation through openings. Doctor Schack's book contains almost 20 pages of well selected physical constants such as thermal conductivity, density, specific heat, viscosity, and radiation coefficients.

All formulae are derived from first principles, and the reliability of experimental coefficients is critically discussed and compared with available data. The author has done fairly well in utilizing international data, although German experimenters, quite naturally, predominate.

An early translation of Doctor Schack's work is desirable, because there is no book in the English language now available that offers engineers such information on heat transfer. The book should find a ready market among mechanical engineers (including automotive and refrigerating engineers) chemical engineers, and metallurgists. Heating and ventilating engineers will, likewise, find many valuable hints in this book, particularly in the study of the relations between heat transfer and pressure drop in pipes.

Published by Stahleisen, Dusseldorf, Germany. Pp. 408. Size 5½ in. x 8 in., 41 illustrations. Price 18.50 Marks.

Prof. W. Trinks
Carnegie Institute of Technology

Heating Troubles I Have Met

by the **TROUBLE ENGINEER**

3—A Vapor Vacuum System with an Oil Burner

Is trouble with your vapor vacuum systems and oil burners imaginary or does such a condition exist? The Trouble Engineer discusses here one such system in which difficulties were encountered.

Readers are urged to send details of their heating troubles to the Trouble Engineer, who will answer such questions in these columns.

"VAPOR-VACUUM heating systems and oil burners — never again." Such was the remark of a heating contractor hurled at the Trouble Engineer when a heating job the contractor had installed did not function as he had a right to expect. "Wait a minute," responded the Trouble Engineer, "maybe the trouble is yours and not as serious as you think."

When the Trouble Engineer arrived on the job with the contractor the next morning the temperature ranged between 23° and 25° F. outdoors. We found that the heating contractor had installed the vapor-vacuum system in a first-class, workmanlike manner, with supply and return lines well graded and the entire job well planned. From all appearances the system should have functioned.

Under the boiler was installed an oil burner which was operating well. The oil burner was controlled by a thermostat, located in the dining room on an inside wall and near a central position. In addition to the thermostat a pressure regulator was installed which also controlled the oil burner, closing it down when a pressure of 8 oz. was reached.

Both devices were tested and functioned properly. After a thorough check-up on the entire layout, the Trouble Engineer could not discover a single thing that might be blamed for the failure of the system to heat properly. The rooms were cool and could not be brought up to 70°, in spite of the fact that a check-up on the radiation revealed the fact that the heating contractor did not skimp the job. The flame of the burner was regulated slightly and after 1½ hrs. the temperature of the dining room was brought up to 70°. The other rooms were at 60° and 62° with the radiators partly cold.

The complaint was that the radiators did not heat sufficiently on a cold day to bring the temperature to 70°, and that, at times, the pressure-control device shut down the oil burner when some of the radiators were partly cold. The distant radiators became heated in only three or four coils.

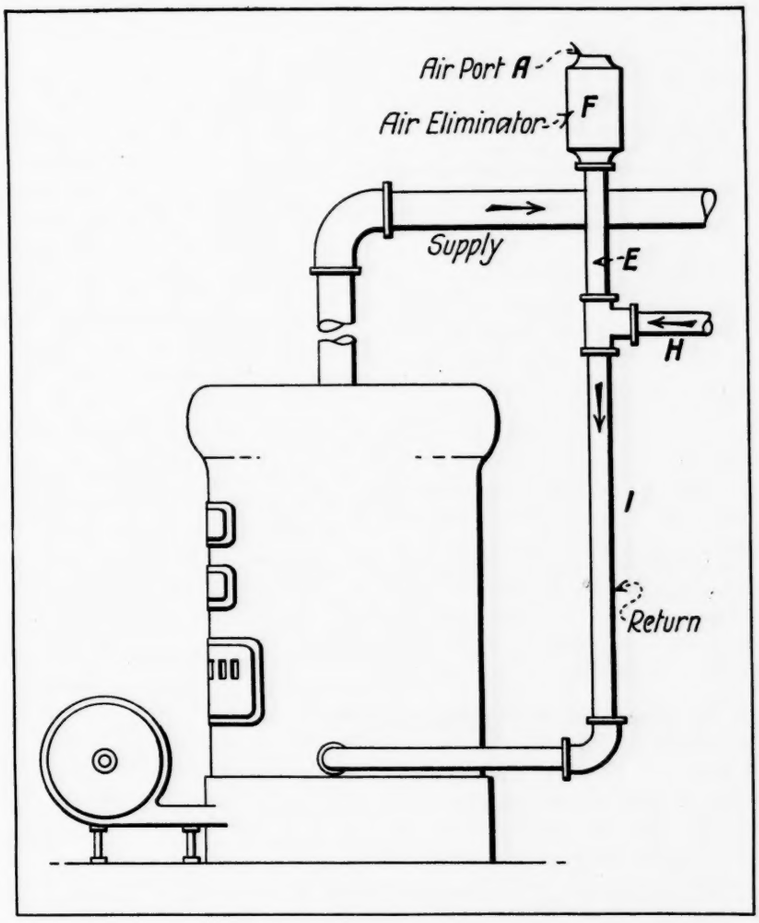


Fig. 1. Boiler Connection

All radiators were equipped with packless valves and radiator traps, the valves at the top of the radiators. In the basement, close to the boiler, an air eliminator was placed on the return line, as shown in Fig. 1. When the thermostat closed down the oil burner there was 6 oz. pressure in the boiler. Finally the temperature in the dining room dropped to 69°. The water level in the boiler remained stationary, proving that all the condensation was returned to the boiler by the air eliminator.

In about 10 min. the thermostat started the oil burner and the pressure rose gradually to 5 oz. At that point the thermostat again shut down the oil burner. All the radiators were examined and it was found that the 22 and 24-coil window radiators, containing 121 and 126 sq. ft. of radiation, respectively, were only partly heated, with the exception of the dining room radiator which was directly over the boiler and the first one on the line. This radiator was heated all the way through.

It was evident that air was pocketed in the radiators which prevented them from heating. The air eliminator was closed tight. What happened to cause the air eliminator to close, with thermostatic traps on the radiators, was a puzzle.

Referring to Fig. 2, which shows a section of the air eliminator, F represents the outer casing into which the valve seat D is screwed. Into this seat a 3/16-in. hole A is drilled to allow the air from the system to escape to the atmosphere. Valve point K is fastened to the thermostatic disc B and this disc is fastened to the copper float C which rests on the raised portion of casing F into which four grooves are cast to allow the air to pass around the float and escape to the atmosphere, and the steam to reach the thermostatic disc B guides G hold the float in alignment with the air port A.

The action of the air eliminator is as follows: Steam from the boiler enters the radiators at the top of the radiators forcing the air and condensation through the traps and return line H, Fig. 1. Air escapes from the system through pipe H into pipe E and into the air eliminator F, Fig. 1, and out of the air port A into the atmosphere.

Should the boiler pressure become too great the condensation is forced into pipe E, Fig. 2, thence into the air eliminator F, raising float C, thus closing valve K, preventing water from being blown out of port A. Should steam enter the return line H from the radiators it passes up pipe E, Figs. 1 and 2, through slots R in the float support, reaching thermostatic disc B which is expanded and port A closed. This action prevents vapor from escaping.

After a careful examination one of the radiator traps was found to be leaking steam. This trap was replaced with a new one.

When the oil burner again was started everything was checked carefully and a record kept for 1½ hrs. During this time the oil burner was started and stopped four times by the action of the thermostat and the fifth time the thermostat started, the oil burner and the pressure controller stopped it. When this happened, the thermostat registered 68° F., and the radiators under the windows were one-third warm and the rest cold or slightly warm.

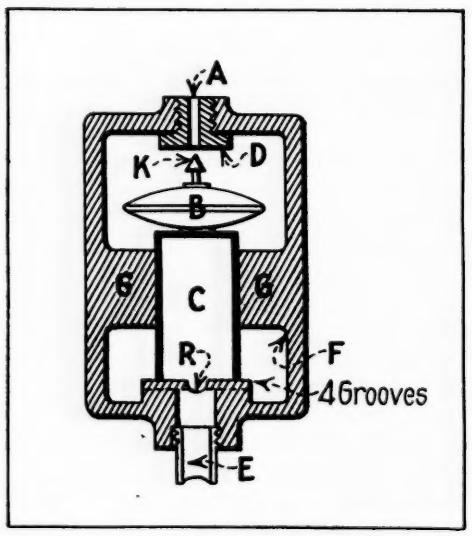


Fig. 2. Section of Air Eliminator as Installed

What happened was this: When the thermostat stopped the oil burner the radiator traps were not closed tight on all the radiators farthest from the boiler because sufficient vapor to fill the radiators completely had not reached these radiators. When the vapor in these radiators condensed, air was drawn into the system through port A, pipe E and return line H. The same thing happened after the thermostatic disc B closed the port A, and the system cooled down.

When the pressure control stopped the oil burner, there was still air in the radiators that was not discharged and additional air entered through air port A.

In order to make absolutely sure that our theory was correct we waited until the old burner was started again, this time by the pressure controller. The intensely hot flame of the burner increased the pressure rapidly so that the thermostat did not get into action. This happened several times, and the radiators and rooms began to cool.

This condition was remedied by shortening the thread on the valve seat D facing the surface slanting toward port A, Fig. 3. A hollow brass ball O, ⅜-in. in diameter, was placed on top of port A and a short piece of brass pipe N screwed into casing F to prevent the ball check from being blown from the seat. After the system was started again all the troubles were over. The system has functioned satisfactorily ever since.

Installation of the ball check O prevented the air from returning to the system, after it was expelled, and the vacuum formed in the radiator, after the vapor condensed, helped materially to fill the radiators with vapor, when either the pressure regulator or the thermostat operated the oil burner.

In order to make sure whether the same trouble would occur, also if the oil burner was controlled by the thermostat only, we removed the connections from the pressure regulator to the motor control, leaving only the thermostat in control of the burner. The ball check valve O, Fig. 3, was removed and it was found that air entered the radiators and remained there, partly filling the radiator.

The radiator in the dining room under the window (the first one off the line, containing 126 sq. ft. of radiation) caused no trouble at all but was responsible for the action of the thermostat, stopping the oil burner before the other radiators were cleared of air. The Trouble Engineer was certain now that, regardless of the control medium, the system would not function properly without the check valve O. After this

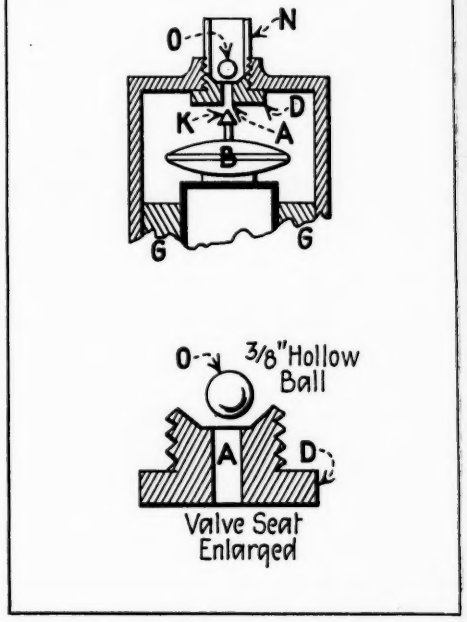


Fig. 3. Air Eliminator Changed to Correct Difficulties

was replaced and the air from the entire system removed by unscrewing the caps of the radiator traps, the system was operated for 4 hrs., controlled by the thermostat only and functioned satisfactorily. This proves conclusively that a check valve of some kind is necessary, to prevent the system from becoming air bound.

Such a condition never was encountered on a vapor system operated by a coal-fired boiler for the reason that it took a much greater time to bring the pressure up to the point where the pressure regulator would close the dampers. On oil-fired boilers the intense flame produces vapor rapidly, causing intermittent operation of burner, and the air has not sufficient time to escape from the system. A higher pressure carried on the system is not desirable for Spring and Fall operation, when but little heat is desired.

A check valve on a vapor system has another advantage, as it aids in creating a vacuum in the system and assists in a rapid circulation of the vapor when the oil burner is started.

A more serious situation exists in vapor jobs installed in three and four-story apartment buildings where air traps and return traps are installed. This condition will be taken up in a later issue.

Erratum

"This Type of Architecture in Dornach, Germany, imitates the Growth of Flowers and Plants," was the caption appearing under the illustration on Page 106, in HEATING AND VENTILATING for November, 1929. Dornach is in Switzerland and not Germany.

Oil Burners Approved Since September 24

IN HEATING AND VENTILATING for December, 1929, a list of domestic oil burners inspected by the Underwriters' Laboratories was published, including those burners approved up to September 24, 1929. The following list includes domestic burners inspected and passed since September 24, up to and including November 19, 1929.

Oil fuel specifications referred to are those accepted as standard by the burner manufacturers, oil producers and refiners, following the standardization project proposed by the Department of Commerce, and adopted last summer as standard by the industry.

Burners listed are classified as domestic, and are those machines, irrespective of size or heating capacity, which are suitable for use where an attendant is not constantly on the premises. They are provided with automatic devices for the prevention of abnormal discharge of oil at the burner. Burners of this class are intended principally for heating dwellings, but may be permitted by authorities having jurisdiction for use in industrial plants and for heating apartment houses and the like.

All burners listed are mechanical draft burners except where the notation "natural draft" occurs in the column under the heading "Motor Drive."

MANUFACTURER	MOTOR DRIVE	SAFETY CONTROL	IGNITION	FUEL FEED	MARKING	FUEL
Baker Oil Burners, Inc., Denver, Colo.	A.C.	Combustion ("Type L"). (Minneapolis-Honeywell "Type A" or "Type BPR-1" Protectorelay and "Type A" or "Type B" combustion thermostat) anti-flooding device ("Type M") (own manufacture trip bucket and switch).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "Type A" or "Type B" on Minneapolis-Honeywell combustion thermostat when burner is equipped with "Type A or BPR-1" Protectorelay.	Not heavier than No. 2 "Type M", not heavier than No. 3 "Type L".
Ballard, Arthur H., Inc. of Mass., Boston, Mass.	A.C. or D.C.	Combustion (Mercoid "Type SA" combustion thermostat, or "Type S" Adjustatherm with "Type L" combustion thermostat or "Type SDE" Adjustatherm with "Type M-1" combustion thermostat).	Gas or electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on burner housing; also "Type C" on nozzle unit housing and "Type SA" or "Type L" or "Type M-1" on Mercoid combustion thermostat.	Not heavier than No. 3.
Beacon Oil Burner Corp., White Plains, N. Y.	A.C.	Combustion (Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "No. 48-H" on Time-O-Stat combustion thermostat.	Not heavier than No. 3.
Berggren Engineering Corp., Brooklyn, N. Y.	A.C.	Combustion (Minneapolis-Honeywell "Type A" or "Type BPR-1" Protectorelay with "Type A" combustion thermostat, or "Type DSS" motor switch with "Type B" combustion thermostat, or Time-O-Stat "No. 77" Lockswitch with "No. 48-C" or "No. 48-H" combustion thermostats, or Mercoid "Type SDP" Adjustatherm with "Type M-1" combustion thermostat).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "Type A" or "Type B" on Minneapolis-Honeywell combustion thermostat, or "No. 48-C" or "No. 48-H" on Time-O-Stat combustion thermostat, or "Type M-1" on Mercoid combustion thermostat.	Not heavier than No. 3.
Fluid Heat Inc., Baltimore, Md.	A.C.	Combustion (Minneapolis-Honeywell "Type A" Protectorelay with "Type A" combustion thermostat, or "Type DSS" motor switch with "Type B" combustion thermostat, or Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat).	Gas (expanding pilot) or electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "Type A" or "B" on Minneapolis-Honeywell combustion thermostat, or "No. 48-H" on Time-O-Stat combustion thermostat.	Not heavier than No. 3.
Petroleum Heat and Power Co., New York, N. Y.	A.C. or D.C.	Anti-flooding device (own manufacture trip bucket).	Gas (expanding pilot) or electric (transformer).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on blower housing; also "Type A" on Minneapolis-Honeywell combustion thermostat (electric ignition).	Not heavier than No. 1.
	A.C.	Anti-flooding device (own manufacture trip bucket) or combustion (Minneapolis-Honeywell "Type A" Protectorelay with "Type A" or "Type B" combustion thermostat).	Gas (expanding pilot when Minneapolis Protectorelay controlled).	Suction from supply tank.	Underwriters' Lab. label on safety chamber cover; also "Type N" on burner head castings and combustion chamber trays; also "Model B" on Minneapolis combustion thermostats when Minneapolis Protectorelay equipped.	Not heavier than No. 3.
	A.C.	Combustion (Minneapolis-Honeywell relay and oil control with "Model B-2" combustion thermostat).	Gas, or gas (expanding pilot)	Suction from supply tank or gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on control terminal box; also "Model B-2" on Minneapolis-Honeywell combustion thermostat; also "Model A" on Minneapolis-Honeywell Pyrostat ("Assembly 400" only); also "Assembly 300 or 400 on burner motor terminal box.	Not heavier than No. 1.
	A.C.	Combustion (Minneapolis-Honeywell "Type U-10-D" Protectorelay with "Type B" combustion thermostat or "Type A" Protectorelay with "Type A" combustion thermostat).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "Type B-2" or "Type A" on Minneapolis-Honeywell combustion thermostat.	Not heavier than No. 3.
Porter Corp., J. E., Ottawa, Ill.	A.C.	Combustion (Time-O-Stat "No. 77" Lockswitch with "No. 48-C" combustion thermostat).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "No. 48-C" on Time-O-Stat combustion thermostat.	Not heavier than No. 3.
Preferred Oil Burners, Inc., Peoria, Ill.	A.C.	Combustion (own manufacture safety switch with Hart Type D combustion thermostat for burners "Types D and DO". Allen-Bradley Type J-1552-Form B magnetic switch with thermal reset with Hart Type D combustion thermostat for burner "Type M").	Gas-electric (transformer), or electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on control housing (Types D and DO), or on burner base (Type M); also "Type D" on combustion thermostat and on fuel feed chamber; also "Type DO" on fire door assembly when used; also Type J-1552 on magnetic switch for burner "Type M".	Not heavier than No. 3.
Real-Oil-Heat Burner Co., Winona, Minn.	A.C.	Anti-flooding device (Detroit Lubricator Type "S").	Gas or manual (high-low flame).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on blower housing; also Type B-1 on Minneapolis-Honeywell combustion thermostat.	Not heavier than No. 1.
Scott Oil Co., (Braden System) Manchester, N. H.	A.C.	Combustion (Mercoid "Type SDP" Adjustatherm with "Type L" combustion thermostat).	Electric or gas-electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on burner base; also "Type OB-3 or OB-4" on strainer.	Not heavier than No. 3.
Silent Automatic Corp., Detroit, Mich.	A.C.	Combustion (Minneapolis-Honeywell "Type PRO-1" Protectorelay with "Type B" combustion thermostat).	Gas (expanding pilot).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on control unit line switch; also "Model A" on burner base and gas pilot, or "Model B" on burner motor and gas pilot; also "S-2" on constant level chamber; also "Type B" on Minneapolis-Honeywell combustion thermostat.	Not heavier than No. 1. (Model A burner), not heavier than No. 3, (Model B burner).
S-K Oil Burner Corp., The, Camden, N. J.	A.C.	Anti-flooding device (own manufacture drip bucket).	Gas (expanding pilot).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on blower housing; also "No. 48-C" on Time-O-Stat combustion thermostat.	Not heavier than No. 1.
Timken-Detroit Co., The, Detroit, Mich.	A.C.	Combustion (Minneapolis-Honeywell "Type A" or "Type BPRE-1" Protectorelay with "Type A" combustion thermostat).	Gas (expanding pilot).	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on combination name plate on control unit relay cover and on burner unit motor frame; also "Model U" on gas pilot; also "Model U" or "Model 20" or "S-2" on constant level chamber; also "Type A" on Minneapolis-Honeywell combustion thermostat.	Not heavier than No. 2.
Winslow Boiler & Engineering Co., Chicago, Ill.	A.C.	Anti-flooding device. (Own manufacturer's float switch).	Gas.	Gravity from supply tank or listed automatic pump.	Underwriters' Lab. label on burner base.	Not heavier than No. 1.
York Oil Burner Co., York, Pa.	A.C.	Combustion (Time-O-Stat "No. 77" Lockswitch with "No. 48-H" combustion thermostat).	Electric (transformer).	Suction from supply tank.	Underwriters' Lab. label on blower housing; also "No. 48-H" on Time-O-Stat combustion thermostat.	Not heavier than No. 3.

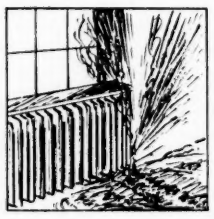
Legal Decisions

Sufficiency of Lien and Notice to File Lien

A subcontractor who had done the work under his contract with a contractor, to furnish all the labor and material necessary to complete the plumbing work and install the hot water heating system in a house, filed a lien as subcontractor against the property, under the Pennsylvania Mechanics' Lien Law. The owner objected that the lien lumped the charge for labor and materials and did not sufficiently itemize the articles furnished. The Pennsylvania Superior Court holds, Currie v. Koehler, 90 Superior Ct. 197, that where labor and materials are furnished by a subcontractor under two contracts with the principal contractor, each for a lump sum, it is not necessary for the subcontractor, in filing his lien, to set out an itemized list of the materials furnished. The Act of April 17, 1905, P. L. 172, requires a statement of the amount claimed to be due and of the kind and amount of materials furnished, but there is no statutory requirement calling for a statement of the price of each article. The object of such information is to give the owner the necessary knowledge to enable him to determine the correctness of the claim and where the information contained in the lien is sufficient on inquiry to give him such knowledge it is all that the law requires. There is no statutory obligation resting on the plaintiff to specify the price of each article where the whole is furnished under a lump contract. In the present case, there was a lump sum for the plumbing work and a lump sum for installing the hot water heater. In the lien filed, the written acceptance of the two bids was set forth at length. It was not necessary for the subcontractor to set out an itemized list of the materials furnished. If there had been no such contract calling for a lump sum, the subcontractor would have been obliged to specify the items of his claim for work and materials under the statute.

The plaintiff's notice of intention to file lien, which recited that there was a contract made for all the plumbing work for a fixed sum and also for installing the hot water system for a fixed sum, both being for the same house and under the same contract, and showed the balance due, and to which was attached the statement showing in detail the materials furnished and the work done and that the last work and the last material were furnished on a certain date, was held to meet the requirements of the Act of March 24, 1909, P. L. 65, which prescribes that the notice shall contain the amount alleged to be due, the nature of the labor and the materials furnished. It furnished the information to the owner so that he could protect himself, which is the end aimed at.

Liability for Leakage from Radiators



In an action for damage to personal property caused by steam from a radiator or radiators in one of the rooms of an apartment occupied by the plaintiff in the defendant's hotel, the New York Appellate Division holds Kessler v. The Ansonia, 222 App. Div. 148, 225 N. Y. Supp. 589, that a clause in a lease providing that the lessor shall not be liable for damage to any property by leakage of water, steam or gas from or into any part of the building, or from any other cause, in any event, exempts the landlord from liability except for acts of affirmative negligence or for failure to remedy actual defects when called to his attention; and relieves him from the ordinary duty imposed to inspect and exercise reasonable care to discover defects, or to prevent them.

Two elbows, one a ninety-degree elbow and the other a forty-five degree elbow, had blown out on a radiator as to which the plaintiff alleged she had previously made complaints about escaping steam, and another forty-five-degrees elbow had blown out on one of the other radiators, causing damage to the property in the room. Plaintiff's complaint alleged as ground of negligence among others, the circulation of an excessive pressure of steam through the radiators or pipes. There was no proof of excessive pressure, and there was evidence tending to show that the radiators were constructed to withstand a steam pressure of 12.5 lbs. and that about the time of the accident the maximum pressure was 5 lbs.

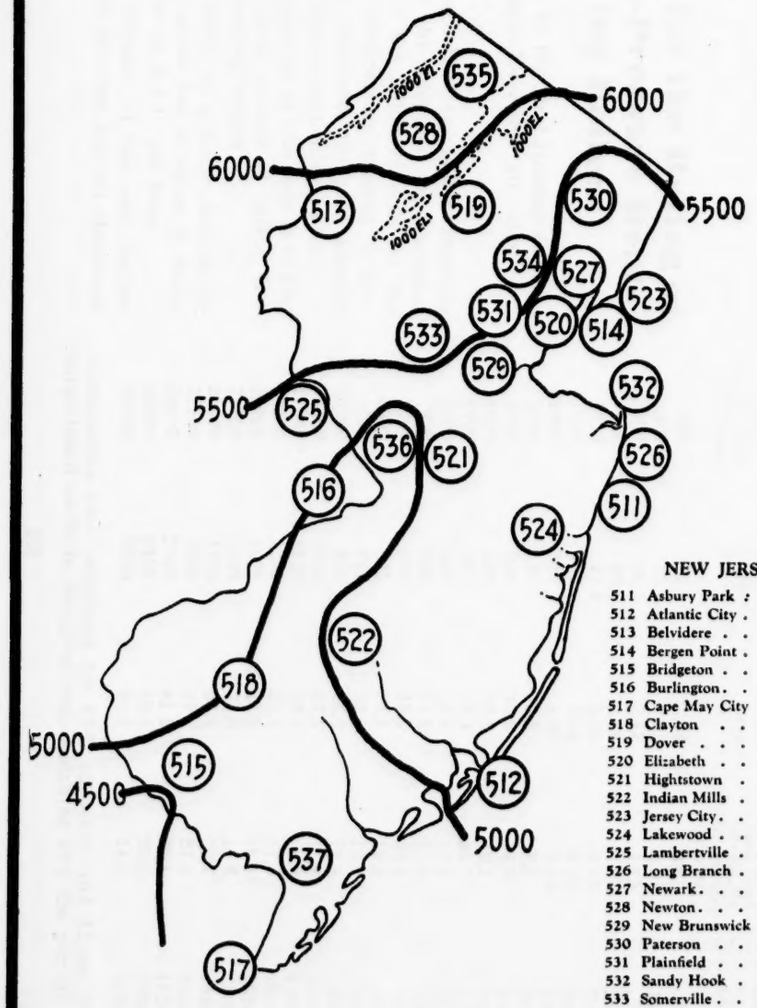
The remaining allegations of negligence were that the defendant neglected to properly inspect the radiators and pipes. It was held the plaintiff's proof was insufficient to establish these allegations; there being no evidence of the nature of the alleged prior defects or of any defects, of the nature of repairs made or of negligence in repairing; and no proof to show connection between the alleged prior defects and the failure to repair, and the condition of the radiators after the accident, both with respect to the amount of steam escaping or the then condition of the radiators. Therefore judgment for the plaintiff (129 Misc. 342) was reversed and a new trial ordered, on the ground that the plaintiff's evidence did not establish a *prima facie* case.

Retail Dealer Held Not to Warrant Ventilating Fan

The Louisiana Court of Appeals holds, Electrical Supply Co. v. Daniels, 119 So. 290, that a vendor of a ventilating fan will not be held to warrant its satisfactory operation when installed by a contractor with whom it had no connection, the fan requiring proper installation to enable it to function properly. The principle that a vendor warrants the thing sold to be for the purpose for which it is intended was held to have no application to such a case. In this case there was no special warranty.

The action was for the price of a blower purchased with the idea of removing the warm air from the stove of defendant's restaurant in order to reduce the temperature in the restaurant. The fan was the product of a manufacturing company, purchased in plaintiff's store and installed by a contractor having no connection with plaintiff. The catalog of the manufacturing company contained a statement that the fan would remove 2200 cu. ft. of fresh air per min. The fan, as installed, did not prove satisfactory, but whether it removed 2200 cu. ft. of air per min. or not was impossible to say. A representative of the manufacturing company, who inspected the installation, told defendant that, as set up, the fan could not possibly function properly, and required a larger hole in the roof for a larger pipe. This the landlord refused to permit being made. The court concluded that the defendant's difficulty was due to the improper installation of the fan, for which the plaintiff was not responsible.

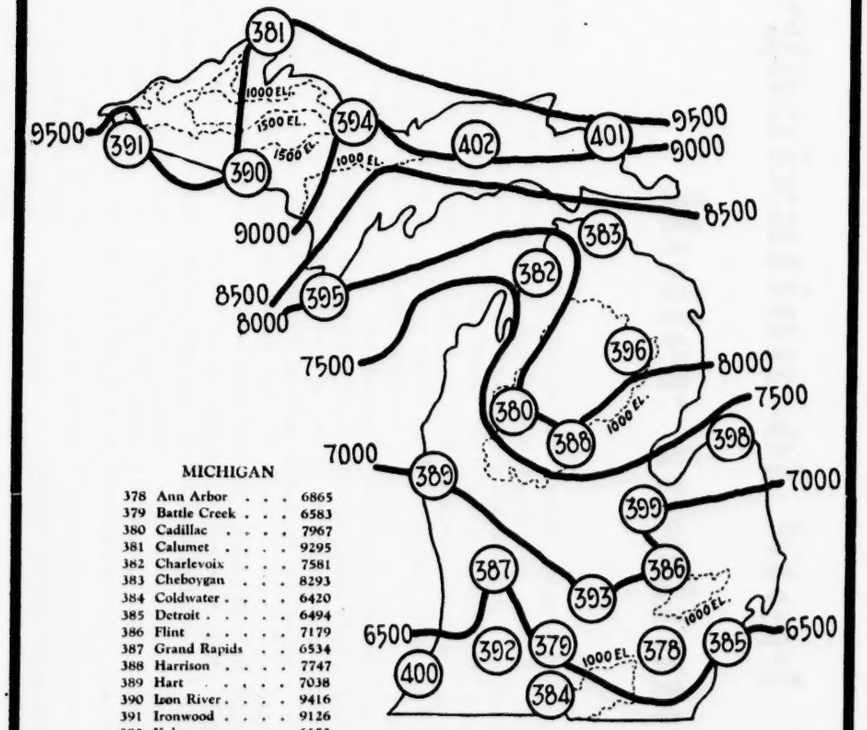
Heating and Ventilating will publish a new degree-day map for the entire country in the February issue. This will be in addition to the state maps which are now running as data sheets, and will give the engineer a better idea of the variation in fuel consumption in different parts of the country.



NEW JERSEY

511	Asbury Park	5273
512	Atlantic City	5175
513	Belvidere	5788
514	Bergen Point	5358
515	Bridgeton	4651
516	Burlington	4998
517	Cape May City	4981
518	Clayton	5045
519	Dover	5970
520	Elizabeth	5302
521	Hightstown	5359
522	Indian Mills	5170
523	Jersey City	5192
524	Lakewood	5400
525	Lambertville	5318
526	Long Branch	5395
527	Newark	5387
528	Newton	6132
529	New Brunswick	5405
530	Paterson	5369
531	Plainfield	5538
532	Sandy Hook	5441
533	Somerville	5586
534	South Orange	5746
535	Sussex	6134
536	Trenton	4934
537	Woodbine	5037

ISO-DEGREE-DAY CHARTS—New Jersey | No. 5-F New Series



MICHIGAN

378	Ann Arbor	6865
379	Battle Creek	6583
380	Cadillac	7967
381	Calumet	9295
382	Charlevoix	7581
383	Cheboygan	8293
384	Coldwater	6420
385	Detroit	6494
386	Flint	7179
387	Grand Rapids	6534
388	Harrison	7747
389	Hart	7038
390	Iron River	9416
391	Ironwood	9126
392	Kalamazoo	6652
393	Lansing	7112
394	Marquette	8692
395	Menominee	8033
396	Mio	8330
397	Pontiac	6921
398	Port Austin	7362
399	Saginaw	7061
400	St. Joseph	6202
401	Sault Ste. Marie	9281
402	Seney	9294

ISO—DEGREE-DAY CHARTS—Michigan | No. 5-G New Series

Organization of Steel Heating Boiler Institute

ANNOUNCEMENT is made of the organization of the Steel Heating Boiler Institute, composed of the leading manufacturers of steel heating boilers. The institute will devote its efforts and activities to all matters that will tend to the betterment of the industry. Headquarters for the institute have been opened in Cleveland, O., at 1116 Guardian Building. Frank S. Records, executive secretary of the institute, will have full charge of the conduct of the institute offices and will devote his entire time to the institute's activities.

Officers of the institute are: President, W. A. Nevin, Heggie-Simplex Boiler Co., Joliet, Ill.; vice-president, W. H. Heagerty, Oil City Boiler Works, Oil City, Pa.; treasurer, J. T. Dillon, Titusville Iron Works Co., 1124 Marine Trust Bldg., Buffalo, N. Y.; executive secretary, Frank S. Records, 1116 Guardian Bldg., Cleveland, O.; directors, R. B. Dickson, Kewanee Boiler Corp., Kewanee, Ill.; J. R. Collette, Pacific Steel Boiler Co., Waukegan, Ill.; J. T. Dillon, Titusville Iron Works, Buffalo, N. Y.; W. H. Heagerty, Oil City Boiler Works, Oil City, Pa.; J. J. Doyle, Ames Iron Works, Oswego, N. Y.; H. E. Seabold, The Brownell Co., Dayton, O., and W. A. Nevin, Heggie-Simplex Boiler Co., Joliet, Ill. Col. William J. Donovan, of New York, has been retained by the institute as its general counsel.

Code for the Rating of Low-Pressure Heating Boilers

Adopted by the Steel Heating Boiler Institute, December 10, 1929

The Steel Heating Boiler Institute announces the adoption, on December 10, 1929, of the following code for the rating of low-pressure heating boilers. This code supersedes the code adopted by the institute, September 10, last:

1. The purpose of this code is to provide a uniform method of rating low-pressure heating boilers.

2. The rating of a boiler shall be expressed as square feet of steam or water radiation or as B.T.U. per hour.

3. For purposes of this code, boilers are divided into two general classes as follows:

A. Steam and water boilers in which solid fuel, hand fired, is used as the heat generating medium.

B. Steam and water boilers in which solid fuel, mechanically fired, oil or gas is used as the heat generating medium.

4. The rating of boiler in Class A, expressed in square feet of steam radiation, shall be not more than fourteen times the heating surface of that boiler in square feet.

5. The grate area of a boiler for the rating as determined by Section 4 shall be not less than that determined by the following formulae:

For boilers with ratings from 300 sq. ft. to 4,000 sq. ft. of steam radiation,

$$\text{Grate Area} = \sqrt{\frac{\text{catalog rating (in sq. ft. steam radiation)} - 200}{25.5}}$$

For boilers with ratings of 4,000 sq. ft. of steam radiation and larger,

$$\text{Grate Area} = \sqrt{\frac{\text{catalog rating (in sq. ft. steam radiation)} - 1500}{16.8}}$$

6. The rating of a boiler in Class B, expressed in square feet of steam radiation, shall be not more than seventeen times the heating surface of that boiler in square feet.

7. The furnace volume of a boiler (as defined in Section 10) for the rating (as determined by Section 6) shall be not less than 1 cu. ft. for every 140 sq. ft. of steam rating.

8. Boilers selected on the basis of this code shall be connected to stack and breeching in accordance with the manufacturer's specifications.

9. The rating as defined above for purposes of selection is intended to correspond to the estimated design load, which is to be the sum of items A, B, C.

In this connection the accompanying table has been worked out by C. E. Bronson, of the Kewanee Boiler Company, a member of the Steel Heating Boiler Institute Committee, to simplify boiler selection according to the code:

TABLE 1. — Minimum heating surface and grate area requirements with corresponding firing characteristics when boiler output is equal to rating.

Boiler Rating Sq. Ft. Steam Radiation	Heating Surface Sq. Ft.	Grate Area Sq. Ft.	Combustion Rate Lbs. Coal per Sq. Ft. Grate Area per hr.	Fuel Charge Lbs.	Firing Period Hours
300	21.4	1.98	4.66	78	8.5
400	28.6	2.80	4.39	111	9.0
500	35.7	3.42	4.49	135	8.8
750	53.6	4.64	4.97	184	8.0
1000	71.4	5.60	5.49	222	7.2
1500	107	7.14	6.47	283	6.1
2000	143	8.39	7.34	332	5.4
2500	178	9.5	8.1	376	4.9
3000	214	10.5	8.8	415	4.5
4000	286	12.2	10.1	483	3.9
5000	357	14.4	10.7	570	3.7
6000	429	16.4	11.2	650	3.5
7000	500	18.1	11.9	716	3.3
8000	571	19.7	12.5	780	3.2
9000	642	21.1	13.1	835	3.0
10000	714	22.5	13.7	890	2.9
12000	857	25.0	14.8	990	2.7
14000	1000	27.3	15.8	1080	2.5
16000	1143	29.4	16.7	1164	2.4
18000	1285	31.4	17.6	1243	2.2
20000	1430	33.2	18.5	1314	2.1
22500	1608	35.3	19.6	1397	2.0
25000	1780	37.4	20.6	1480	1.9
27500	1963	39.3	21.5	1555	1.8
30000	2140	41.1	22.4	1626	1.8
32500	2320	42.9	23.3	1700	1.7
35000	2500	44.5	24.2	1760	1.6

Combustion rate calculated for 65% efficiency and 12,000 B.T.U. coal. Fuel charge based on 10 in. depth of coal, weighing 47.5 lbs. per cu. ft.

A. The estimated normal heat emission of the connected radiation required to heat the building as determined by accepted practice, expressed in square feet of radiation or in B.T.U. per hour.

B. The estimated maximum heat required by water heaters or other apparatus connected to the boiler, expressed in square feet of radiation or in B.T.U. per hour.

C. The estimated heat emission of piping connecting radiation and other apparatus to the boiler, expressed in square feet of radiation or in B.T.U. per hour.

10. Definitions:

For purposes of this code the following definitions will be used:

A. 1 sq. ft. of steam radiation shall be considered equal to the emission of 240 B.T.U. per hour and 1 sq. ft. of water radiation shall be considered equal to the emission of 150 B.T.U. per hour.

B. Heating surface shall be expressed in square feet and include those surfaces in the boiler which are exposed to products of combustion on one side and water on the other. The outer surface of tubes shall be used.

C. Grate area shall be considered as the area of the grate surface expressed in square feet and measured in the plane of the top surface of the grate. For double grate boilers the grate area shall be considered as the area of the upper grate plus one-quarter of the area of the lower grate.

D. Furnace volume shall be considered as the cubical content of the furnace between the top of the base or the normal grate line and the plane of entry into or between the tubes plus the net base volume under the firebox. The net base volume shall be determined by deducting the volume of the refractory lining from the gross base volume under the firebox.

President Thornton Lewis Guest of Wisconsin Chapter

President Thornton Lewis, of the A.S.H.V.E., was the principal guest at the November meeting of the Wisconsin Chapter, held November 18, at the Elks Club, Milwaukee. Mr. Lewis referred to the forthcoming summer meeting of the society to be held in Minneapolis. He made the point that the nation is becoming "air conscious" and told of the increase in real estate values due to ventilation. He discussed the latest developments in the school ventilation controversy and the work done in cooperation with the United States Public Health Service in the interests of mechanical ventilation.

American Society of Heating and Ventilating Engineers

Program for the Annual Meeting

Many activities are planned for members of the society who will assemble for the 36th annual meeting at the Benjamin Franklin Hotel, Philadelphia, Pa., during the week of January 27, for a four-day meeting.

Registration will open on Monday, January 27, at the Benjamin Franklin Hotel. The first day is reserved for council and committee meetings and inspection trips to nearby industrial plants.

At 10.00 o'clock Tuesday, January 28, the first technical session will be opened by President Thornton Lewis. Each morning thereafter technical sessions will be held at the Benjamin Franklin Hotel.

In the afternoon the technical sessions will be held in the Commercial Museum and will begin promptly at 2:30 P. M. so that there will be plenty of time to discuss papers and inspect the International Heating and Ventilating Exposition, housed in the same building and open from noon until 10:00 P. M.

Social events will commence Monday evening when the arrangements committee of the local chapter will greet the arriving guests. Ladies will be entertained at dinner, following which a theater party is planned. Refreshments will be served to both men and women about 11:00 P. M.

Special arrangements have been made for the entertainment of the ladies during their stay in Philadelphia. They will have an opportunity to visit Valley Forge and other historic spots, as well as enjoy afternoon tea, a breakfast bridge and a shopping tour.

The main social event of the meeting will be the annual banquet on Thursday evening, January 30, at the Benjamin Franklin Hotel. A feature of the banquet will be the presentation of the Past President Emblem, and there will also be several surprise novelties which have been arranged by the local chapter members.

Past presidents of the society as usual will hold their annual dinner and the officers and council will entertain the authors of papers.

The technical program will cover the following:

Reports

President's message.
Reports of officers and council committees.
Report of committee on research.
Report of research director and technical advisory committees.
Reports of special committees.

Codes

Report of continuing committee on testing and rating of low-pressure steam heating boilers, by L. A. Harding.
Report of committee on testing and rating unit heaters, by D. E. French.

Technical Papers

Preventing Condensation on Interior Building Surfaces, by Paul D. Close.
Pressure Difference across Windows in Relation to Wind Velocity, by J. E. Emswiler and W. C. Randall.
Some Studies of Airation of Garages, by W. C. Randall and L. W. Leonhard.
Power from Process and Space Heating Steam, by L. A. Harding.
Air Infiltration Through Various Types of Brick Wall Construction, by G. L. Larson, D. W. Nelson and C. Braatz.
Air Conditioning of the Halls of Congress, by L. L. Lewis and A. E. Stacey.
Measurement of the Flow of Air Through Registers and Grilles, by Prof. L. Davies.
Surface Transmission Coefficients, by Rowley, Algren and Blackshaw.
Absorption of Solar Radiation in its Relation to the Temperature, Color, Angle and other Characteristics of the Absorbing Surface, by F. C. Houghten and Carl Gutberlet.
Rating of Heating Boilers by Their Physical Characteristics, by C. E. Bronson.
Methods of Testing Unit Heaters Suitable for Field Use, by L. S. O'Bannon.
Pipe Sizes for Hot Water Heating Systems, by Elmer Smith and F. E. Giesecke.
Panel Warming, by L. W. Fowler.
Tests of Disc and Propeller Fans, by A. I. Brown.

Society to Hold Summer Meeting in Minneapolis

Announcement is made that the next semi-annual meeting of the A.S.H.V.E. will be held in Minneapolis, Minn., during the week of June 16. Headquarters will be at the Curtis Hotel.

A. S. H. V. E. Committee Spikes Open-Window Propaganda

Acting on the protest of a special committee of the A.S.H.V.E., the United States Public Health Service, through Surgeon General Hugh S. Cumming, has agreed to publish a bulletin to be prepared by the committee in answer to a

news release issued by the United States Public Health Service last September, which was looked upon as thinly-disguised open-window propaganda. The release went on to state that "simple window ventilation with gravity exhaust is considered best for the ordinary class room . . . The window board ventilator for each window and an outlet on the opposite wall near the ceiling, or in the ceiling, which leads to a roof ventilator, is the most economical and healthful method available today."

Promptly upon publication of this item, the office of the United States Public Health Service was bombarded with protesting letters from such men as President Thornton Lewis, of the A.S.H.V.E., Director F. C. Houghten, of the A.S.H.V.E. Research Laboratory, and Secretary E. B. Cresap, of the National Association of Fan Manufacturers.

Mr. Lewis, in his letter, asked for copies of material and references bearing upon school ventilation which caused the Public Health Service to arrive at its conclusion.

Director F. C. Houghten voiced the prevailing opinion, both of air-conditioning engineers and physicians, when he stated that "some humidity control is desirable, particularly in cold climates, and unless you are willing to completely throw out any reference to humidity control as being necessary, you cannot satisfactorily ventilate or air condition a schoolroom without mechanical equipment . . .

"It is further the universal opinion of air-conditioning engineers, that in a school of any size, open-window ventilation is not only unsatisfactory but economically wasteful."

Judge Cresap declared: "Your bulletin deals with a question which has been and is in process of discussion and debate by the best engineers in the country. It is a question upon which there is not unanimity of opinion among engineers. We would respectfully inquire whether you consider it consistent for your department to state to the public that a scientific question which has not been settled by scientists has been definitely settled. We would greatly appreciate it if you would advise us how you reconcile the conclusions stated in this bulletin with the information that has come out of the Bureau of Mines on this subject."

In a typical reply on the part of the surgeon-general's office, it was brought out that the bulletin in question was based on a study of the relationship between types of school ventilation and respiratory illness in certain schools of New Haven, Conn. "I feel quite sure that I am correct in saying," wrote the surgeon in charge, "that the service is not committed in favor of any type or method of ventilation. From our observations it would seem that different methods have their particular application, depending upon the nature of the problem, and certainly where air conditioning is feasible, especially from an economic standpoint, in the control of temperature, air motion, and relative humidity, it is unquestionably the ideal method to be sought after."

So important, however, was the matter considered, that at a council meeting of the A.S.H.V.E. in Pittsburgh, November 4, President Thornton Lewis appointed a committee to wait on the surgeon-general, November 12. Those comprising the committee, in addition to President Lewis, were Director F. C. Houghten; Dean F. Paul Anderson, of the University of Kentucky; Past-President Champlain L. Riley, of New York; Prof. A. C. Willard, of the University of Illinois; Past-President J. R. McColl, of Detroit; Past-President J. I. Lyle, of Newark; Thomas J. Duffield, former secretary of the New York Commission on Ventilation; Secretary A. V. Hutchinson of the A.S.H.V.E. and Dr. E. Vernon Hill of Chicago.

This committee was accorded a sympathetic reception at the office of the surgeon-general and was informed by Surgeon-General Cumming that the material embodied in the bulletin had been prepared many months before by a member of the staff, who now is in Europe. He then suggested that the committee prepare a statement containing a résumé of the current scientific opinion, which he could incorporate in a bulletin to be issued by the United States Public Health Service. At his suggestion it was further arranged to broadcast the bulletin over the radio. Such a bulletin is now being prepared by the committee.

Contractors Guests of Massachusetts Chapter

Members of the Heating and Piping Contractors Boston Association were guests of the Massachusetts Chapter of the society at the regular monthly luncheon, November 12. The program committee of the chapter had arranged a lecture and demonstration by Leo Sherman of the Vinco Company, of New York. A specially-designed glass apparatus which was, in effect, a heating boiler, showed the action of various materials on boilers which cause foaming and priming.

W. H. Oleson, manager of the Boston association, will speak before the Massachusetts Chapter, January 6. He will give a discussion of certified heating and will be accompanied by E. A. Dusossoit, of Lynch and Woodward, Inc., chairman of the local certified heat committee.

Illinois Chapter Stages Symposium on Temperature Control

Temperature control was the principal subject for discussion at the December meeting of the Illinois Chapter, held December 9, at the Hotel Sherman, Chicago. The speakers were confined to representatives of temperature-control manufacturers. Each speaker was limited to ten minutes and was expected to discuss in particular the new developments in the field covered by his company.

L. O. Grauer, of the Accessory Division of the American Radiator Company, described the Mercoid line of controls for making or breaking the electrical circuit in accordance with temperature or pressure changes. He also referred to the dual control equipment for application to unit heaters, according to the temperature of the return lines, as well as the room temperature.

G. C. Kingsland, of the Minneapolis-Honeywell Company, drew particular attention to the broad field of controls, in addition to the conventional room thermostat. He described zone control equipment for application to unit heaters singly and in groups, actuated by the return-line temperature as well as by the room temperature. He also described equipment designed to maintain fixed temperatures in radiators.

Homer Norton, of the National Regulator Company, after referring to the National system of dual control, called attention to the general recognition now given to the importance and value of temperature control. He predicted a continuing greater willingness of people to purchase the comfort and health that temperature control represents.

F. I. Raymond, of the F. I. Raymond Company, devoted his discussion to the application of the Duo Stat for balancing, either in steam or water heating plants, the rate of heat lost from the building with the rate of heat supplied. He mentioned particularly the practice of applying the indoor tube of his control to the last radiator or the last riser in the longest steam run, whereby such a radiator may be assured of steam supply before the source of heat is cut out. He mentioned satisfactory performance of single-pipe jobs thus controlled. Mr. Raymond made the point that the Duo Stat has a field of its own and that in temperature control systems, it might well be used in addition to a master control.

J. R. Vernon, of the Johnson Service Company, devoted particular attention to the company's dual thermostat and the dual system of temperature regulation. He told how it was possible, from a central point, to set the thermostat at a lower point so as to secure econ-

omy during the night; how any occupant working late need merely push an indicator to secure again, in his quarters, the daytime-occupancy temperature without affecting other rooms, and finally, how, later, all such thermostats may again be restored to night-time operation.

W. P. McFarland, of the Powers Regulator Company, gave a general talk on temperature control and steam control, with particular reference to the progress of his company.

F. L. Hutchinson, of the Conco Temperature Control Company, explained in detail the company's directly-applied temperature control instrument, including its principle of operation.

During the business session, President Thomas introduced R. E. Moore, of the Bell and Gossett Company, who has been appointed chairman of the chapter's membership committee.

Eleven new members were elected.

Wrought Pipe Subject at Michigan Chapter Meeting

Seventy-three members and guests attended the monthly meeting of the Michigan Chapter of the society, held December 16 at the Cadillac Athletic Club, Detroit.

After a roll-call and the committee reports, George Clifford, district manager of A. M. Byers Company, was introduced by President William Boales. After a few words from Mr. Clifford, President Boales introduced the speaker of the evening, Dr. James Aston, dean of the School of Mining and Metallurgy at Carnegie Institute of Technology. Dr. Aston is also consulting metallurgist for the A. M. Byers Company. His talk, which was illustrated with motion pictures, covered in a thorough manner the manufacture of wrought-iron pipe.

After Dr. Aston's address, there was a general discussion participated in by several of the members, following which the meeting was turned over to William Whelan, who conducted a Feather Party, which was enjoyed by all of the members and guests. Numerous prizes in the form of turkeys, ducks, and chickens were distributed to the holders of lucky cards.

Kansas City Chapter Discusses District Heating

District heating was the subject for discussion at the November meeting of the Kansas City Chapter, held at the Ambassador Hotel, Kansas City, November 12. The principal speakers were John Arthur and David Caleb, who gave some interesting details of the new steam distributing system recently constructed by the district steam company in Kansas City.

Heat Transmission Coefficients Discussed at Kansas City

Prof. F. B. Rowley, of the University of Minnesota, was the principal speaker at the December meeting of the Kansas City Chapter, held December 9. Professor Rowley's subject was the "Effect of Air Space and Surface Coefficients on Heat Transmission." He described the tests and data secured in the university laboratory at Minneapolis. These tests were primarily directed to check the coefficients of surface transmission with various air velocities. He further elaborated upon past experiments, giving the value of air space of different widths, as regards their insulation value.

The paper was an advance outline of the same subject which Professor Rowley will present at the annual meeting in Philadelphia. The discussion brought out the fact that an air space insulation over 3 in. was of no additional value and might prove detrimental, due to additional air circulation in larger air spaces.

Following Prof. Rowley's paper Amdi Worm spoke on the "Economy of Insulation in Houses." Mr. Worm discussed a recent paper of the society which attempted to rate various insulations. He further elaborated on this subject by reviewing an additional paper, setting forth the savings possible where insulation was used.

Forty-one members and guests attended the meeting.

Pipe Welding in the Northwest

Pipe welding, as applied to the heating industry, was discussed by the Pacific Northwest Chapter at its November meeting, held in the Gold Room of the New Washington Hotel, Seattle, Wash. Through the courtesy of William White, of the Smith Welding Equipment Corporation, a film on this subject was presented.

It was the general opinion of the members present that pipe welding had a very definite application and that most local contractors were using it in certain classes of work. However, it was doubtful if welding of exposed radiator runouts or exposed risers would be in general use until the appearance of the finished work was improved.

In industrial and power work, it was brought out, there have been some prominent installations of welded pipe exclusively or screwed piping and welded piping combined. Notable among these is the new Puget Sound Power and Lighting Company's power plant at Renton, Wash., where screwed joints and welding are both used. This plant is designed for 800 lbs. working pressure. In the new automobile plant of the Fisher Body Company, in Seattle, welded pipe is used throughout.

Wisconsin Chapter

H. W. Schmidt, supervisor of buildings of the State Department of Public Instruction, Madison, Wis., was the principal speaker at the December meeting of the Wisconsin Chapter, held at the Elks' Club, December 9.

The subject of Mr. Schmidt's talk was "Field Experiences and Observations of Public School Heating and Ventilating Systems."

Officers Nominated for Philadelphia Chapter

Nominations for officers of the Philadelphia Chapter made at the chapter's December meeting, are: For president, Harry Black; for vice-president, E. N. Sanbern; for secretary, L. C. Davidson; for treasurer, Walter Wild; for members of the board of governors, A. C. Edgar, A. J. Nesbitt and M. P. Blankin.

Following a brief business meeting, the chapter held a dance and card party in the Betsy Ross room of the Benjamin Franklin Hotel.

Death of Henry Adams

Henry Adams, a charter member of the A.S.H.V.E. and its president in 1899, died suddenly at his home in Baltimore, December 9. He was 71 years old. Mr. Adams began his business career in Baltimore in 1880, being associated with Bartlett & Hayward of that city. In 1884, he became chief engineer of The Supervising Architect's Office in Washington, where he had charge of the heating and ventilating design for all of the Federal buildings. While holding that office, he established the mechanical department of the bureau in 1898.

In the same year, he left the department to open an office in Baltimore as consulting engineer. During the ensuing years he designed the mechanical equipment for many of the largest buildings in Baltimore and other cities.

At the time of his death, he was president of the Maryland Institute, with which he had been connected for 45 years. For twelve years he was an instructor at the institute. During part of that time he was a member of the Board of Managers and later vice-president. He had held the office of president since 1920.

During the World War, Mr. Adams served as fuel engineer for the States of Maryland and Delaware.

Heating and Piping Contractors National Association

Team Play in the Heating Industry

In a holiday message to the industry, Secretary Henry B. Gombers, secretary of the Heating and Piping Contractors National Association, referred to the recent conferences arranged by President Hoover for the purpose of keeping business on an even keel and speeding it up. "The whole theme," he said, "was tinged with the advice to keep your feet on the ground and your head up in the air, *and* especially *team work* is to be desired—what more can be said to the men who are engaged in the heating industry?

"This much can be added concerning team work. Business has so many ramifications today that it is greatly affected by other interests than the one in which we may respectively be engaged; and it is of vital importance that our own industry must be represented by those in it who can command the respect of all other industries coming in contact with it....

"There has been a great advance in the science of heating since our national association was formed in the year 1889, and at this writing even greater advances are predicted by those who have a vision and who are not visionary.

"So it behooves those who are engaged in our important division of the great building business to keep in step and engage in that team play which the big business men advocate."

Anthracite Club Discusses Certified Heating

Certified Heating was the principal subject discussed at the meeting of the Anthracite Club, held at the Printers' Craft Club, New York, December 11. Ninety members and guests were present.

Joseph C. Fitts, assistant secretary of the Heating and Piping Contractors National Association, was the speaker and explained the whole system of Certified Heating to the club. He told of the formation of the Engineering Standards, and the Radiation Estimating Sheets used in 47 cities. Following these, the boiler rating charts were worked up, to these were added the data pipe sizes. The standards have been in use since 1923.

The reaction of the organization to Mr. Fitts' talk was extremely favorable. Members who discussed the subject were L. N. Burnside, fuel engineer, The Delaware, Lackawanna & Western Coal Company; A. F. Duemler, manager, metropolitan New York district, Anthracite Coal Service, and others. W. E. Taylor, executive secretary of the Heating and Piping Contractors New York City Association, was asked whether the association could cooperate with the Anthracite Club in investigating the possibilities of a plan for inspecting existing heating plants, since the program for Certified Heating extends only to new installations.

Mr. Taylor replied that his personal reaction was favorable. H. Eastwood, chief engineer of the Combustion Specialties Corporation, moved that the president appoint a committee to wait on a committee of the Heating and Piping Contractors New York City Association to determine what grounds the contractors and the Anthracite Club have in common in a movement toward an inspection of domestic heating plants. President Oscar Ostby appointed the following committee: Dwight H. Faulkner, H. B. Smith Company; A. F. Duemler; H. Eastwood; Noel Cunningham, Domestic Stoker Company; Clifford Strock, HEATING AND VENTILATING, and L. M. Burnside, D. L. & W. Coal Company.

Henry B. Gombers, secretary of the Heating and Piping Contractors National Association, was introduced as the "dean of trade association secretaries," having held that position for the past 33 years. M. E. Durkee, of the New York City Association, expressed his pleasure at the interest being taken in Certified Heating and expressed his willingness to cooperate to the fullest extent in the movement proposed.

Chairman C. W. Farrar, of the membership drive, was also present and addressed the meeting. He was followed by Howard Haupt, chairman of the Wisconsin Chapter's membership committee.

Salisbury Engineer for Detroit Certified Heating

W. C. Salisbury, formerly of the Rockwood Sprinkler Company of Detroit, has been appointed engineer of Certified Heating for the Heating and Piping Contractors Detroit Association. Mr. Salisbury graduated from the Massachusetts Institute of Technology in 1911 as a mechanical engineer. Since that time, for about 13 years, he has been associated in the automatic sprinkler field, having had three years in the sales of domestic oil burners in Minneapolis, and three years in Cleveland as branch manager of the Guaranteed Heat Corporation, selling and installing warm-air heating equipment.

Central New York Association Formed

The Heating and Piping Contractors Central New York Association, Inc., was chartered at Albany to operate in Oneida, Herkimer, Madison, Oswego, Fulton, Essex and Hamilton Counties, New York. Those men incorporating the association are: George Hughes, William T. Cantwell, W. E. Stradling, William Hameline, Paul W. Schneider, Paul Hamjy and H. J. Brandeles, all of Utica, where the central office is located.

Application will be made for membership in the national association.

Boston Association Adds Members

Three new members have been added to the list of the Heating and Piping Contractors Boston Association, Inc., at Boston. The contractor member is R. B. Crocker Co., 107 Massachusetts Ave., Boston, and the associate members are the Reading Iron Co., Reading, Pa., and Spang, Chalfant & Co., Inc., Pittsburgh, Pa. There are 29 contractor members and 14 associate members in this association.

Heating Industry Represented at Washington Economic Clinic

H. T. Richardson, president, Institute of Boiler and Radiator Manufacturers, M. J. Beirn, a vice-president of the American Radiator Company, and Howard Coonley, president, Walworth Company, were among the representatives of 32 manufacturing and distributing groups, which met at the United States Chamber of Commerce headquarters in Washington, D. C., December 5, to consider, at the request of President Hoover, measures looking to the maintenance of business activities at their present high levels.

President Hoover, Secretary Lamont, Assistant Secretary Klein, of the Department of Commerce, and other government officials were present. Measures dealing with the present and future economic situations were discussed. It was stressed that there was no marked weakness in the present business situation, but, on the contrary, surprising strength is shown, due in a large measure to wise practices followed in the past few years.

Plumbing and Heating Industries Bureau

Bureau Participates in President Hoover's Business Survey Conference

Plumbing and Heating Industries Bureau was invited to attend the National Business Survey Conference of 250 leaders in American business and industry called by the Chamber of Commerce of the United States at the request of President Herbert Hoover. The conference was held at the Chamber of Commerce Building, Washington, D. C., December 5.

The purpose of this conference was to ascertain the present business situation, to forecast the trend of industry for the next six months, and to organize a permanent industrial body to cooperate with President Hoover and the Department of Commerce.

Representatives of American industry in attendance at the conference were invited to answer two questions:

1. What is the condition of your industry this year as compared with last year?

2. What are the prospects for the first six months of 1930, as compared with the first six months of 1929?

Following is an abstract from the statement given to the conference by the Plumbing and Heating Industries Bureau:

"In so far as labor is concerned, rates of wages have been generally stable for the past four years with the highest and medium rates fixed and the average rate increasing slightly owing to the wage increases in cities having the lowest wage rates.

"For the last three years, generally speaking, the two industries have not employed all the men available, with somewhat more unemployment for the past ten months.

"Our industries show a decrease of 16.2% in the sales of material for the first nine months of 1929, as compared with the corresponding period in 1928.

"As far as the next six months are concerned, we anticipate little increase over the period under discussion except such seasonal fluctuations as are normal in the industries. While we foresee an increase in new construction, we believe it will be of a character that will be of little significance to our industries.

"In view of the uncertainty with regard to any widespread residential construction program and the incidental delay in inaugurating a national building program, may it not be well to consider the immediate possibilities offered through rehabilitating existing structures?"

Supplementary to this report, the Bureau presented to the Conference detailed statistics on the relative condition of the industries for the first nine months of 1929, and the first nine months of 1928. Those relating to the heating industry are as follows:

	1928	1929	Per Cent Inc. or Dec.
Cast Iron Boilers and Radiators (thousands of pounds)			
Round Boilers			
Shipments	110,298	99,853	— 9.5
New Orders	112,527	92,910	—17.4
Square Boilers			
Shipments	221,533	174,656	—21.2
New Orders	229,584	177,654	—22.6
Stocks on hand—slightly above normal			
Radiators (thousands of square feet)			
Shipments	105,276	86,782	—17.6
New Orders	112,945	91,962	—18.6
Stocks on hand—normal.			

In pointing out to the conference that its survey of the plumbing and heating industries showed a decrease of 16.2% for the period from January 1, 1929, to October 1, 1929, as compared with the corresponding months in 1928, the bureau called attention to the fact that this decrease has come about in spite of the fact that the wholesale prices of typical plumbing and heating commodities have been increased only 46% over the 1913 level, while the index of construction costs is 206.9 for the period under discussion as compared with 100 in 1913.

"It is not particularly difficult to give the reason for the present depression in our industries," the bureau stated. "Building as a whole has dropped 15.1% for the period under discussion. While it is true that commercial and industrial building showed a slight increase, this favorable trend was overcome by the larger decrease in residences, etc., from which our industries get their major volume.

"Our industries' business comes from two principal sources, new construction, and replacements, additions and repairs.

"Naturally any drop in new construction affects about 60% of our industries' volume. The remaining 40% fluctuates with our ability to convince the public of the soundness of increasing their sanitary and heating equipment or replacing worn out or obsolete equipment.

"Our only hope for increased volume will be through an increase in the residential construction market and through increased effectiveness in our merchandising efforts."

President Hoover addressed the conference and explained that "the extension and organization of the construction and maintenance work of the country" was the object in calling the conference. The president said that the great field of construction could be made into a balance wheel of stability. Perhaps the key-note of his address was this terse statement: "I have no desire to preach. I may, however, mention one good old word—work."

Other speakers were R. P. Lamont, Secretary of Commerce; Julius Klein, Assistant Secretary of Commerce; William Butterworth, president of the Chamber of Commerce of the United States, and Julius H. Barnes, chairman of the Board of the Chamber.

All speakers stressed the importance of the construction industry and many pointed out the great market possibilities in rehabilitation work. Particularly Mr. Klein stressed the modernizing market.

After the above talks were given, representatives of the major industries present were called on for reports on the condition of their industries. Gigantic anticipated expenditures were reported by railroads, utilities, steel and other industries. Building material representatives, while generally optimistic for the "long pull" were cautious in committing themselves about the immediate future.

One thought was injected that aroused considerable interest, namely, that cities are not generally overbuilt. In Chicago, for example, only 4.7% of residence and store property is vacant. Ten per cent vacancies are considered normal.

Representing the Plumbing and Heating Industries Bureau at the conference were Jere Sheehan, Jr., president of the bureau; Walter Klie, chairman of the bureau's executive committee, and E. L. Flentje, secretary-manager.

The Heating and Piping Contractors National Association was represented by Joseph C. Fitts, who supported the bu-

reau's committee by supplying a statistical analysis of the heating industry.

Cooperation Between Bureau and Institute Assured

As a result of a conference between representatives of the Plumbing and Heating Industries Bureau and the Plumbing and Heating Institute held in New York, November 19, cooperation between the two organizations, in outlining and putting into effect policies for the promotion of the welfare of the two industries, is assured.

Failure of members of the various branches of the industries to follow uniform and standardized policies was discussed at the meeting of the board of directors of the Plumbing and Heating Industries Bureau in Chicago, November 14, at which time it was decided to make policy-determination one of the principal activities of the bureau during the coming year.

All organizations in the industries will be asked by the board of directors of the bureau to commit themselves to a policy of cooperation with the bureau in determining and in carrying out uniform policies.

Future of the Plumbing and Heating Industries' Bureau

Rumors that the Plumbing and Heating Industries' Bureau is "slipping" or is likely to terminate its activities are set at rest in a circular letter issued by the bureau through E. L. Flentje, secretary-manager. It is true, as Mr. Flentje states, that the revision of the bureau's program will enable it to operate on a reduced budget estimated at $100,000 for 1930, in place of the previous budget of $400,000.

Mr. Flentje calls attention again to the purpose of the bureau, which he states is predicated on six beliefs:

1. That the present channel of distribution, namely manufacturer, wholesaler, contractor should be maintained.
2. That the bureau offers a common meeting ground for the discussion and solution of industries' problems.
3. That the bureau does not and will not duplicate, parallel or usurp the activities of any existing group.
4. That the public can be induced to purchase more and better products of our industries through judicious, free publicity in newspapers and magazines.
5. That the contractor can be made a better customer and salesman through practical educational aids.
6. That these principles are the collective responsibility of the industries as a whole and are best developed through group activity, supporting and simplifying the endeavors of the individuals and companies in the industries.

At the January meeting of the board of directors of the bureau, a proposal will be made to include, on the board, representatives of all existing associations and groups within the industries. Such affiliation, it is believed, will enable the bureau effectively to aid with the projects and activities carried on by the various associations and groups.

With the revisions indicated, the bureau's board of directors want to consider, with the aid of representatives from existing associations, possible solutions to the following major problems:

1. Direct selling competition.
2. National credit policies.
3. Merchandising activities.

The board believes that certain efforts along these three lines are scattered and sometimes work at cross purposes. It believes that only through national policies, formulated and administered through existing groups, can real progress be made.

Beginning with the March, 1930, issue, the Plumbing and Heating Industries Bulletin will appear as a "sales manual," featuring articles on how to sell a specific product or group of products. The bulletin will be written by a salesman-writer who actually sells the article before he writes about it. One of the other important activities of the bureau, which will be continued, is the sale and use of bookkeeping sets and supplies.

Presidents' and Secretaries' Conference in Chicago

The eighth annual Presidents' and Secretaries' Conference will be held under the auspices of the Plumbing and Heating Industries Bureau at the Congress Hotel in Chicago, January 13-15.

While the conference is held primarily for presidents and secretaries of the national, state and local associations in the plumbing and heating industries, the meetings are open to members of the associations.

Death of George G. Harvey

George G. Harvey, president of A. Harvey's Sons' Mfg. Co., Detroit, Mich., died at his home, November 18. Mr. Harvey was in his 58th year and had been connected with the Harvey company for 40 years. The business was founded by his grandfather, Andrew Harvey, and upon the death of his uncle, James Harvey, in 1928, he became president, which position he held to the time of his death.

Edmund Grassler

Edmund Grassler, member of the firm of Grassler & Gezelschap, 214 Third St., Milwaukee, Wis., died at the age of 69, October 29, after an illness of more than a year. Mr. Grassler was a member of the national executive committee of the Heating and Piping Contractors National Association for seven years before the term director was used, and in June, 1918, he was elected national president

Edmund Grassler

at the national convention in Chicago. For many years he guided the work of the Milwaukee local association and the Wisconsin state association, serving at times as president of both associations.

W. C. Wiedenmann

W. C. Wiedenmann, senior member of W. C. Wiedenmann & Son Sheet Metal Works, 1820 Harrison St., Kansas City, Mo., died suddenly at his office, November 11. He was 60 years old and had been engaged in the sheet metal contracting business since 1892. Mr. Wiedenmann was an active worker in the Kansas City Association of Sheet Metal Contractors and was a trustee of the National Association of Sheet Metal Contractors.

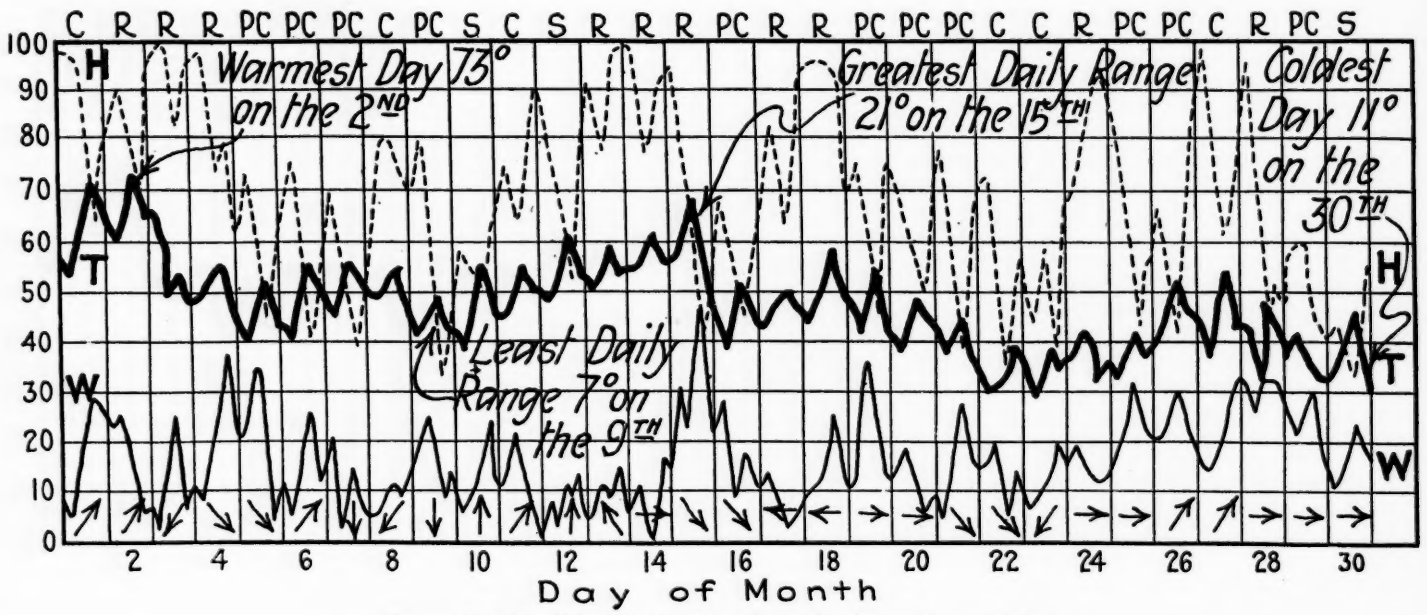
R. M. Milligan

It will come as a shock to many, particularly those who attended the meeting of the American Society of Heating and Ventilating Engineers in St. Louis in 1927, to learn of the death of Rockwell M. Milligan, for the past fifteen years commissioner of school buildings in St. Louis. He died in that city September 30, of apoplexy, at the age of 61.

Mr. Milligan was a warm supporter of the late Edwin S. Hallett in his use of ozone in connection with the heating and ventilating of the St. Louis schools. He is succeeded as building commissioner by George W. Sanger.

The Weather for November, 1929

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F.	73	77	76	54	69
Date of highest temperature	2	2	1	9	12
Lowest temperature, deg. F.	11	12	1	1	3
Date of lowest temperature	30	30	30	29	30
Greatest daily range, deg. F.	21	21	24	24	23
Date of greatest daily range	15	26	10	25	30
Least daily range, deg. F.	7	4	6	2	3
Date of least daily range	9	4	19	13	14
Mean temperature for month, deg. F.	46.0	44.7	41.0	36.3	41.5
Normal mean temperature for month, deg. F.	44.2	42.0	43.2	40.1	45.4
Total precipitation, this month, inches	2.08	3.01	3.38	1.47	1.41
Total snowfall, this month, inches	Trace	3.0	0.5	0.1	6.5
Normal precipitation, this month, inches	2.96	3.33	2.29	2.37	2.83
Total wind movement, this month, miles	10,103	5,093	6,273	7,085	6,981
Average hourly wind velocity, miles	14.0	7.1	8.7	9.8	9.7
Prevailing direction of wind	W	W	S.W.	S.W.	N.W.
Number of clear days	3	9	5	11	9
Number of partly cloudy days	11	8	8	4	9
Number of cloudy days	16	13	17	15	12
Number of days with precipitation	11	12	14	7	5
Number of days with trace or more snowfall	3	3	8	6	2
Snow on ground at end of month	None	None	Trace	None	5.1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Warmest Day 73° on the 2ND
Least Daily Range 7° on the 9TH
Greatest Daily Range 21° on the 15TH
Coldest Day 11° on the 30TH
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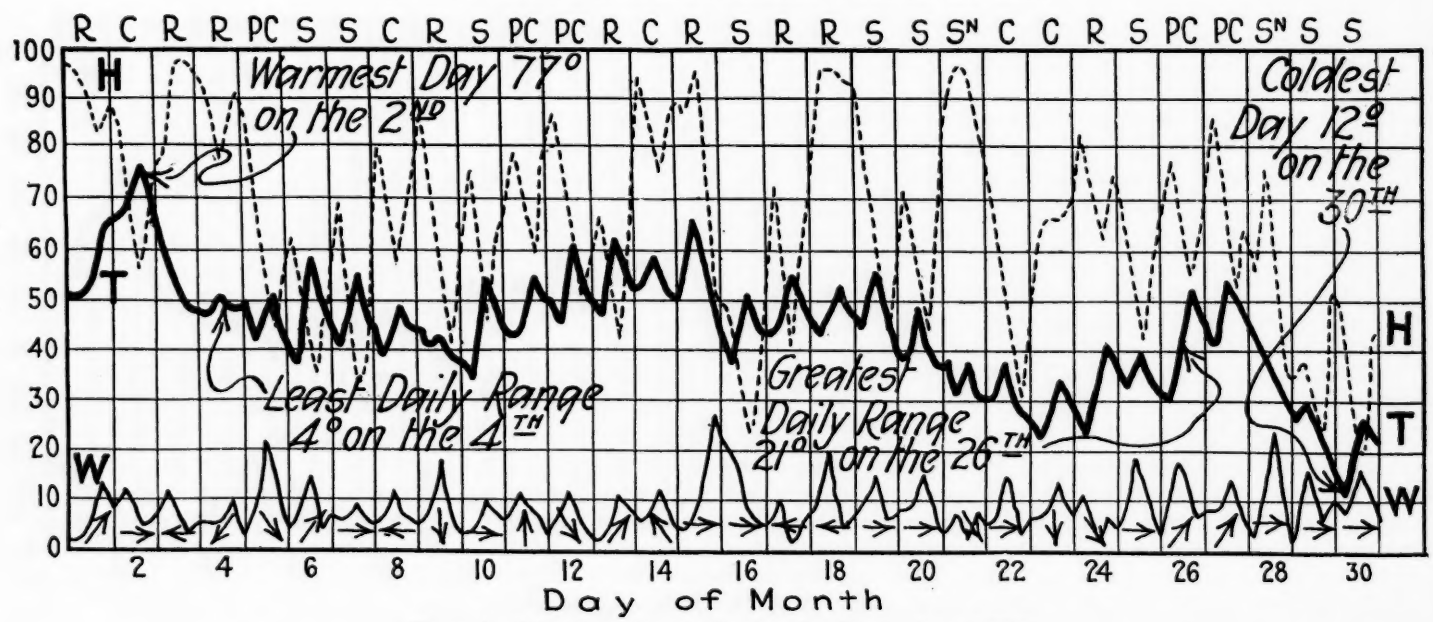
Day of Month

Record of the Weather in New York for November, 1929
(Hourly Observation of the Relative Humidity Plotted on this Chart)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Warmest Day 77° on the 2ND
Least Daily Range 4° on the 4TH
Greatest Daily Range 21° on the 26TH
Coldest Day 12° on the 30TH
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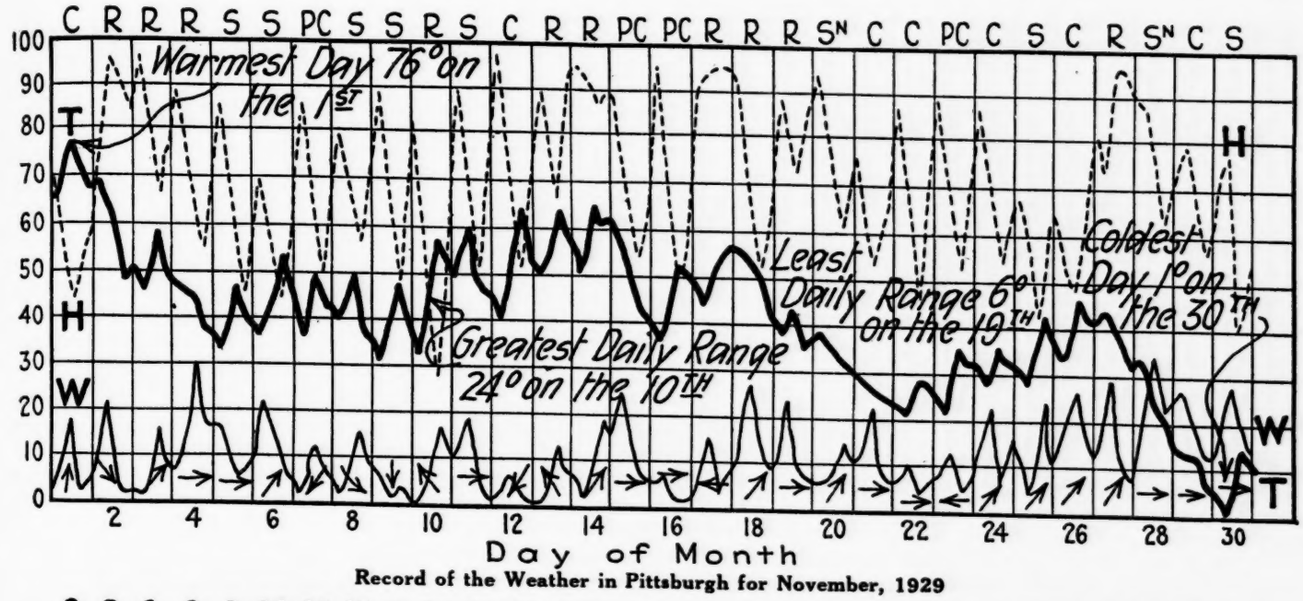
Day of Month

Record of the Weather in Boston for November, 1929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Greatest Daily Range 24° on the 10TH
Least Daily Range 6° on the 19TH
Coldest Day 1° on the 30TH
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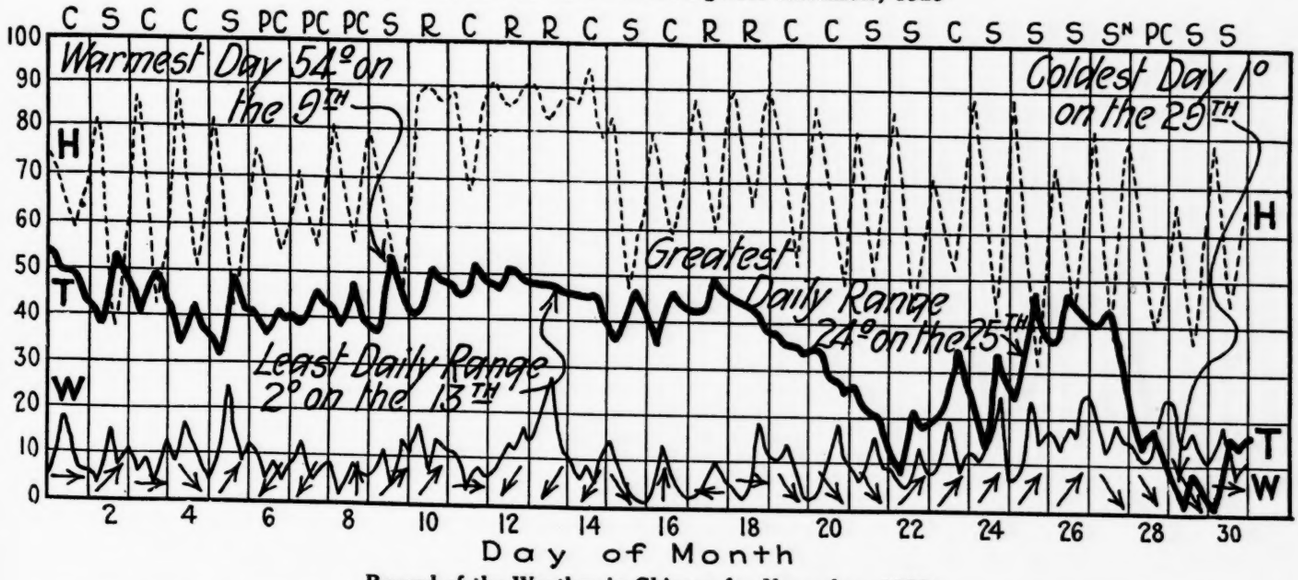
Day of Month

Record of the Weather in Pittsburgh for November, 1929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Warmest Day 54° on the 9TH
Coldest Day 1° on the 29TH
Greatest Daily Range 24° on the 25TH
Least Daily Range 2° on the 13TH
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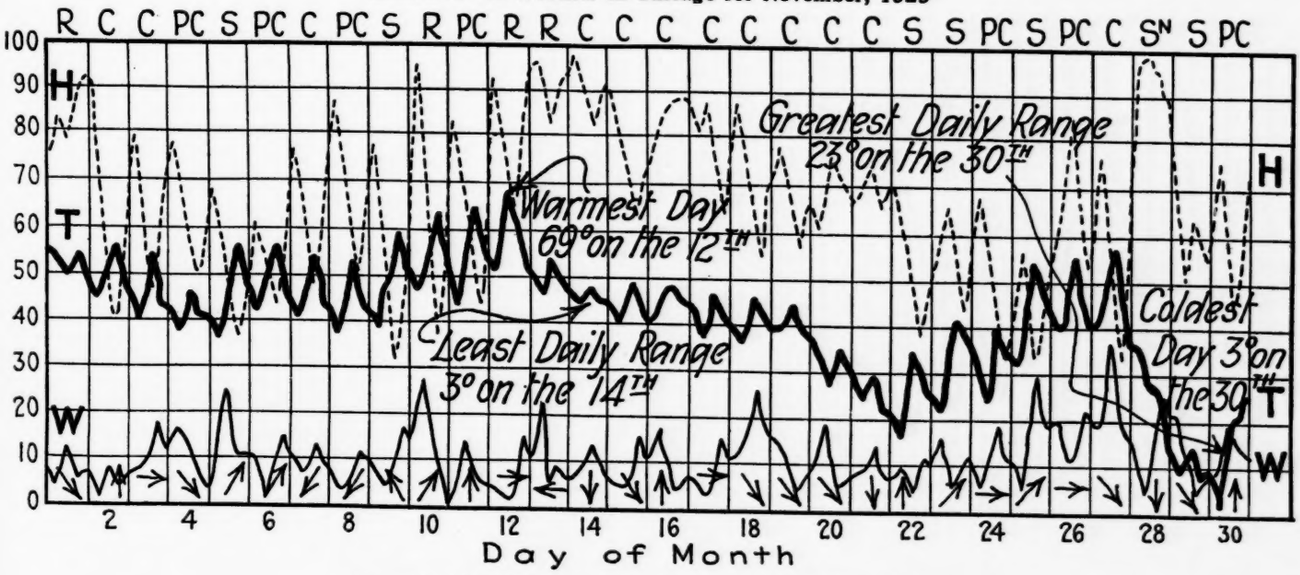
Day of Month

Record of the Weather in Chicago for November, 1929


R C C PC S PC C PC S R PC R R C C C C C C C C C S S PC S PC C SN S PC
Greatest Daily Range 23° on the 30TH
Warmest Day 69° on the 12TH
Least Daily Range 3° on the 14TH
Coldest Day 3° on the 30TH
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Day of Month

Record of the Weather in St. Louis for November, 1929

Plotted from records especially compiled for HEATING AND VENTILATING by the United States Weather Bureau.
Heavy lines indicate temperatures in degree F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M. Arrows fly with prevailing directions of wind.
S—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow.

Degree-Days and Unit Fuel Consumption in Nine Cities for November

IN addition to the monthly totals in degree-days presented for nine typical cities, the unit fuel consumption for these cities for the month of November is included. The figures are given in pounds of coal, gallons of oil, and cubic feet of gas per square foot of steam radiation for the month of October, calculated on the basis of radiation installed for a zero to 70° temperature difference and an efficiency of 100%.

Corrections must be made for efficiencies, heat content of fuel other than that listed below, for radiation emitting other than 240 B.T.U. per hr., and for radiation calculated on a basis of other than zero to 70°.

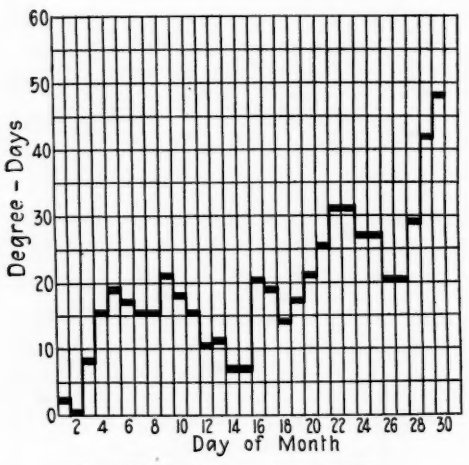
Coal is assumed as having a heat content of 12,000 B.T.U. per lb., gas, 1000 B.T.U. per cu. ft., and oil 140,000 B.T.U. per gal. To correct for other heating values, multiply the fuel consumption listed under the charts by the standard heat content just listed, and divide by the heat content in question.

To correct for efficiency, divide the fuel consumption by the efficiency of the heating installation.

For water radiation, multiply the fuel consumption, which is given for steam radiation, by $\frac{5}{8}$.

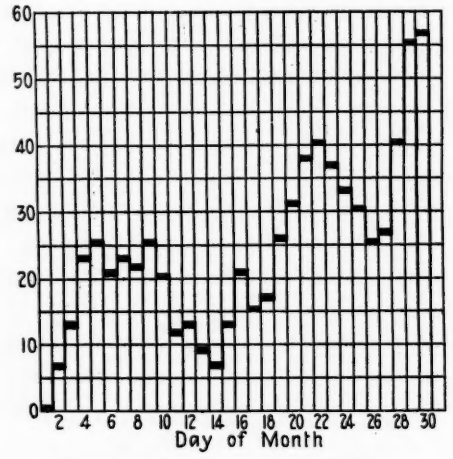
If fuel consumption is estimated for radiation installed for $-10°$ outside temperature, multiply the fuel consumption by 7/8. If the radiation was calculated for $+10°$, multiply by 7/6.

In other words, for radiation installed for any other outside temperatures than zero, multiply the fuel consumption given under the charts by 70°, divided by the quantity (70 minus the outside temperature used).



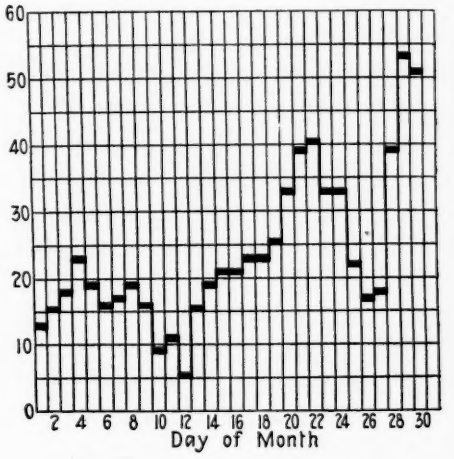
New York, November, 1929
Degree-Days 571—to Date, 964

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 4.57
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.3915
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 54.82
(See Footnote)



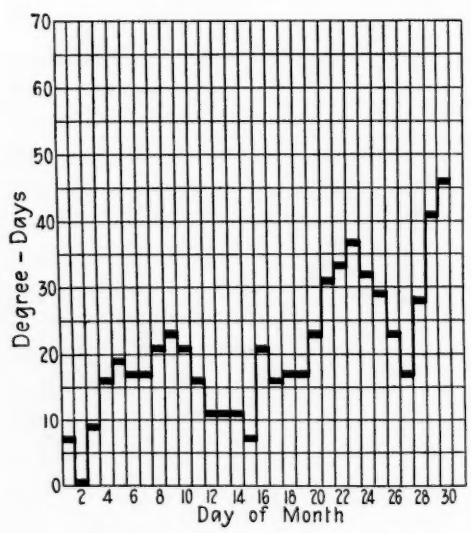
Pittsburgh, November, 1929
Degree-Days 725—to Date, 1211

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 5.80
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.4971
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 69.60
(See Footnote)



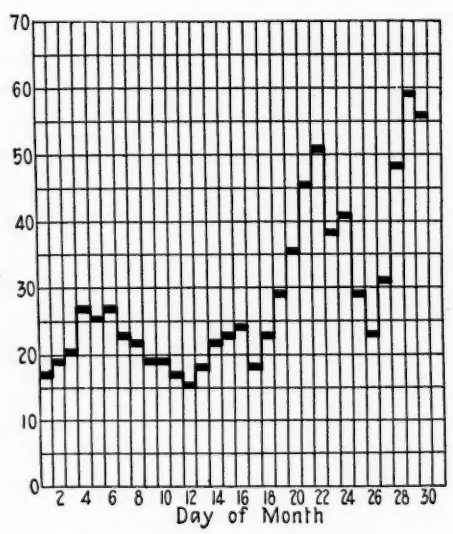
St. Louis, November, 1929
Degree-Days 706—to Date, 967

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 5.65
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.4841
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 67.78
(See Footnote)



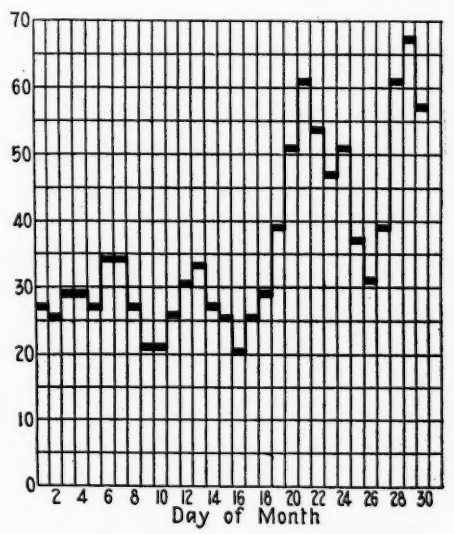
Boston, November, 1929
Degree-Days 617—to Date, 1089

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 4.94
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.4230
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 59.23
(See Footnote)



Chicago, November, 1929
Degree-Days 863—to Date, 1336

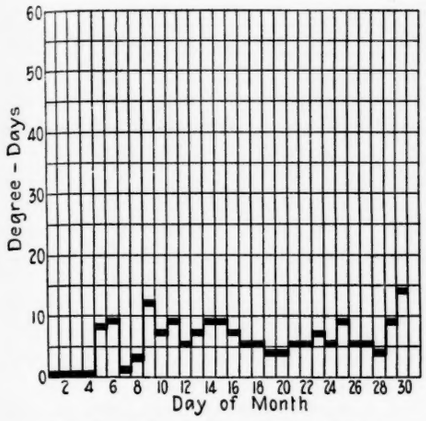
Lbs. of Coal per Sq. Ft. of Radiation for this Month, 6.90
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.5918
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 82.85
(See Footnote)



Minneapolis, November, 1929
Degree-Days 1083—to Date, 1801

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 8.66
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.7426
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 103.97
(See Footnote)

These figures must be corrected for local conditions as explained above.

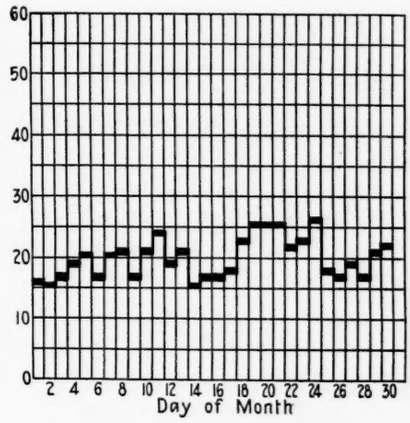


San Francisco, November, 1929

Degree-Days 172—to Date, 375

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 1.38
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.1179
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 16.51

(See Footnote, page 110)

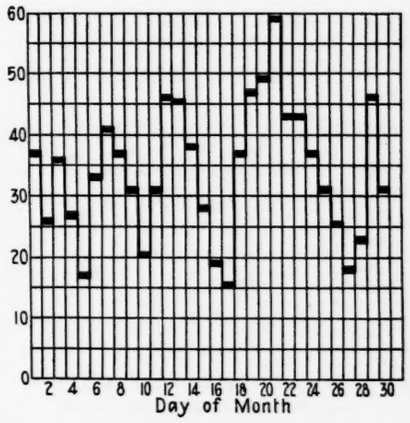


Seattle, November, 1929

Degree-Days 597—to Date, 1032

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 4.78
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.4094
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 57.31

(See Footnote, page 110)



Denver, November, 1929

Degree-Days, 1006—to Date, 1663

Lbs. of Coal per Sq. Ft. of Radiation for this Month, 8.05
Gals. of Oil per Sq. Ft. of Radiation for this Month, 0.6898
Cu. Ft. of Gas per Sq. Ft. of Radiation for this Month, 96.58

(See Footnote, page 110)

Massachusetts Adopts Special Boiler Construction Code

A boiler construction code for steel and cast-iron low-pressure heating boilers was adopted in the Commonwealth of Massachusetts, October 23, but does not become mandatory until April 23, 1930. The new state code contains some important differences from the A.S.M.E. Low Pressure Heating Boiler Code.

Among the important clauses in the code are those embodied in Paragraphs 40 and 47, which state that the longitudinal seams of steel boilers cannot be welded. Paragraph 48 reduces the size of boilers over which the longitudinal seams must be butt-riveted from 60 in. in diameter, specified in the A. S. M. E. rules, to 48 in. in the Massachusetts code.

Paragraph 8 requires that the caulking edges of plates, butt straps and heads of riveted boilers shall be planed, milled or chipped to a depth of not less than 1/8 in. Steel boiler manufacturers claim that this part of the new code, while necessary in a high-pressure boiler code, has no place in the low-pressure boiler rules. Paragraph 13 contains an obvious error, in that it specifies that the carbon content of the steel plates shall not exceed 20%. This percentage should have been 0.20%.

Requirements for safety valves have been drawn up with a 5-in. valve as the maximum size needed, as compared with a 4½-in. valve, the maximum specified in the A. S. M. E. code.

The history of the new code is of considerable interest. Twenty-two years ago, there was a disastrous boiler explosion at the Grover shoe factory, at Brockton, Mass., which, with the ensuing fire, cost the lives of two hundred people; as a result the state authorized a boiler code which was prepared under the chairmanship of John A. Stevens. This code served as a model for many other such codes, including our present A.S.M.E. Code.

This first Massachusetts boiler code covered only one type, namely, riveted power boilers, and did not differentiate, as the A.S.M.E. Code did in 1918, between this type and the low-pressure, steel heating boilers, although recently the State of Massachusetts allowed steel heating boilers to be built on special permission to individual manufacturers.

For the past four years, the members of the Boiler Rules Committee in Massachusetts have been working on the recently adopted code. Many manufacturers of steel heating boilers, while particularly in favor of such a code, believe that the code should conform to practice in vogue for every other state in the Union, and at a hearing before the Governor's Council, July 30, 1929, they suggested revisions in the code for this purpose.

The A. S. M. E. code either is officially adopted, recognized or permitted by all other states having laws relating to low-pressure boilers. If the Board of Boiler Rules of Massachusetts is correct in its stand, then the A. S. M. E. code fails fully to protect the public it is designed to benefit. On the other hand, if the A. S. M. E. code is sound, the State of Massachusetts is imposing a hardship on the steel boiler manufacturers. This is especially true of Paragraphs 40 and 47, which bar the welded longitudinal seam. It is a general opinion among engineers that such welded seams are safe, and experience in thousands of installations throughout the country seem to have confirmed this judgment.

Proper Size Coke for Domestic Heating Plants

Extensive studies of the effects of the size of coke on the operation of the domestic heating plant have been made at the Pittsburgh Experiment Station of the Bureau of Mines. Settings of the dampers to obtain equally good results with different sizes were determined, as well as the limiting size, larger than which it would be impossible to obtain such results when using coke in an average-sized domestic heating plant. It was found that the fire would go out at low rates of combustion required for domestic heating if the coke consisted entirely of pieces larger than those passing through a 2-in. and 3-in. screen.

When compared with small-sized coke ranging from ½ to 1-in. size with a large coke of from 2-in. to 3-in. size, the advantages of the small coke are that it is easier to start the fire, it is less likely to go out, there is a greater range of damper adjustment so that the furnace is more easily controlled, and firings will not need to be so frequent.

Disadvantages are that a greater draft is required, more clinkers are formed, due to the hotter fire, and a lower efficiency is obtained due to the carbon monoxide being higher with a poor mixing of the gases and the air, and because the flue gas temperature is higher, due to the combustion taking place above the fuel bed, with a higher initial temperature of the gases entering the passes.

This comparison shows that a small coke makes a fuel bed which burns more easily than the large size, but the chimney must be capable of supplying sufficient draft.

The conclusions were that the best satisfaction would be obtained with a medium size coke of about 1½-in.

American Oil Burner Association

Keen Interest Indicated in 1930 Oil Burner Show

Fifty-seven manufacturers have engaged space at the National Oil Burner Show to be held at the Hotel Stevens, Chicago, during the seventh annual convention of the American Oil Burner Association, April 7-12. They include nearly all the leading burner manufacturers and some of the outstanding makers of heating accessories.

Demand for space indicates keen sales competition in this field during the coming year. The directors of the association will meet at the Hotel Stevens on Tuesday, January 14, to consider plans for the convention and to hear the report of Executive Secretary, Harry F. Tapp, who is in charge of arrangements for the exposition.

The decision to make this an exposition that will appeal to consumers as well as to the trade has met the approval of exhibitors. Local advertising and other means will be used to attract the right class of individual prospects in Chicago. The exposition will be open every day from 1:30 to 11 P. M. and will continue for six days, making it the longest in the history of the industry.

Wide Variance in Country's Climate

After a survey of conditions affecting the household heating throughout the country from October to May, the Oil Heating Institute declares that nationalism in the United States does not extend to the climate. The wide range of climatic conditions during these months is shown by differences among local average temperatures of more than 40°. The report was compiled from records of the U. S. Weather Bureau for reference in the installation of automatic oil-heating systems.

In 15 cities, the local differences between the average temperature from October to May and the record low temperature averaged 65.7°.

The extreme was a spread of 84° between the average and the low record reported by Havre, Mont., which has an average winter temperature of 27.7°, and a minimum of 57 below zero. These shifts in temperature, which sometimes occur overnight are responsible for heavy losses due to frozen water pipes and sickness resulting from the difficulty of adjusting indoor temperatures to meet sudden changes. The survey, in the institute's opinion, emphasizes the importance of modern heating systems which automatically adjust themselves to variations of heat and cold.

Among these fifteen cities, San Francisco and Los Angeles have the most equable October-to-May climates, the former showing a range of but 25° between average and extreme low temperatures, and Los Angeles a variation of 31°. New York, with an average of 40° and an extreme low of 6 below zero, has a variation of 46, which is 13° less than the range in Chicago, where the average is 36° and the minimum 23 below zero. Detroit, with an average of 35° and a low of 24 below zero, shows the same variation as Chicago.

Of the other cities included in this survey, Philadelphia, with an average for the eight months of 50° and a low of 6 below zero, has a variation of 46, the same as New York; Birmingham, Ala., with an average of 54°, shows a low record of 10 below zero, a variation of 64; New Orleans, with an average of 61° and a low of 7°, has a variation of 54; Louisville, with an average of 45° and a low of 20 below zero, a variation of 65; Indianapolis, average 40°, low 25 below zero, variation 65; Lincoln, Neb., average 37°, low 29 below zero, variation 66; Spokane, Wash., average 37, low 30 below, variation 67; Concord, N. H., average 33°, low 35 below, variation 68; Denver, Colo., average 39, low 29 below, variation 68. Jacksonville, Fla., with the highest average temperature, 62°, reports a low record of 10°, and a range of 52.

Proposed Ordinance Requires Use of Stokers or Oil Burners

Thirty-five members and guests attended the regular monthly luncheon meeting of the Chicago Oil Burner Association, held on Tuesday, November 12, at the Maryland Hotel, Chicago.

Members were informed that an ordinance was being drawn up whereby every boiler exceeding 20 H. P. will have to be equipped with either an oil burner or automatic stoker. He urged the association to appoint representatives to be present at the conference held in this connection, to answer questions as to oil burner specifications and other details. As a result of his suggestion, President McCormack appointed I. D. Groak, Hugh Bitter and C. N. Lockwood to act as this committee.

A. D. King, secretary of the Burning Oil Distributors' Association of Chicago, spoke on the benefits to be derived from trade association cooperation, stating that if the oil and oil-burner industry hoped to be strong enough to carry on in the face of the organized gas and coal industries, members would have to work together. He suggested that a committee be appointed to work with a committee from the Burning Oil Distributors' Association, and that the common problems be worked out in that way. A lengthy discussion followed Mr. King's talk, after which F. I. Raymond, T. N. Andrew and Daniel Daugherty were appointed to act on this committee.

Resignation of the duties of secretary-treasurer of Cliff W. Presdee was read and accepted by the association with regrets.

New Officers of Chicago Oil Burner Association

At a meeting of the board of directors of the Chicago Oil Burner Association on Tuesday, November 19, H. A. Adams, of the Wayne Company, was elected vice-president, and C. N. Lockwood, of the Rayfield Mfg. Company, and T. N. Andrew, of the Timken-Detroit Company, were elected to membership on the board.

Oil-Burner Shipments for October

October shipments of oil burners, as reported by fifty manufacturers whose output in 1927 amounted to 50% of the total, were 15,038, as compared with 13,723 in September.

Of this total, 10,435 were mechanical draft domestic burners; 3,497 were natural draft domestic burners, and the remainder were industrial type burners.

New Publications

National Fire Protection Association Year Book for 1929-1930 has been published from the association's headquarters in Boston, Mass. In addition to the officers and committees of the association, the year book contains a membership directory of some 4722 names. Among the committees listed, is one on blower systems for heating, ventilating, and refuse conveying, Robert Palm, chairman, Verona, N. J.; one on building construction, Charles E. Paul, chairman, Armour Institute, Chicago; one on construction operations, William B. White, chairman, 85 John Street, New York; one on dust explosion hazards, David J. Price, chairman, Bureau of Chemistry and Soils, Department of Agriculture, Washington, D. C., and one on garages, A. C. Newell, chairman, 85 John St., New York. Size 6 in. x 9 in. Pp. 190.

Present Practice in Water Heating

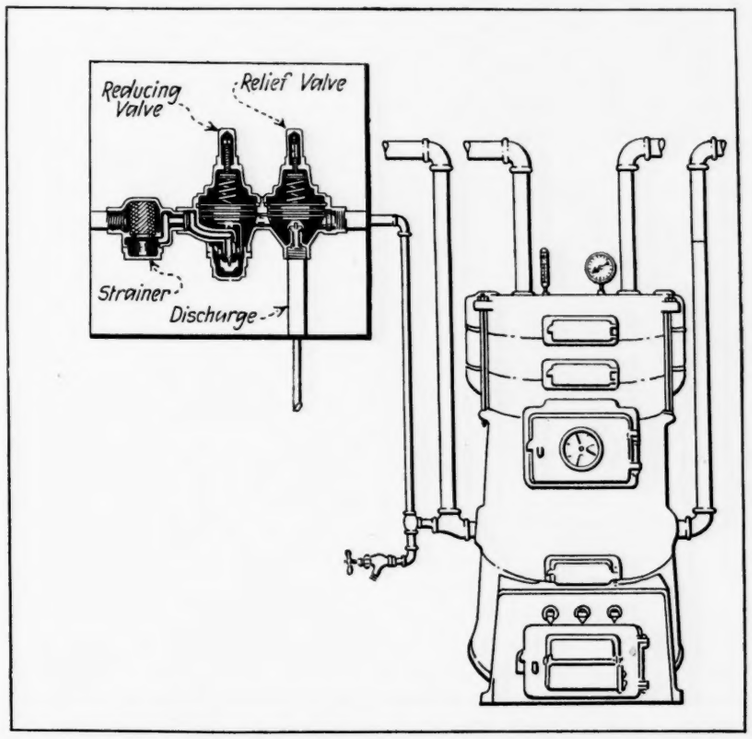
VII. Kainer Pressure Governor

A GRAVITY hot-water heating system equipped with the pressure governor, hot water damper regulator, pressure gauge, made by Kainer and Co., Chicago, can be made into an automatic and fully closed system, which maintains uniform room temperatures by controlling the water temperature, effects an economy in fuel and lengthens the interval between firing periods.

Use of the pressure governor eliminates the use of the expansion tank and fittings and closes the system so as to speed up circulation and increase the heat transmission. The pressure governor is constructed of bronze, and contains a bellows diaphragm sensitive to any set pressure. The diaphragm is used on both valve units.

The pressure reducing unit permits a full flow of water which quickly fills the system when first installed. The governor is tested at 60 lbs. and set at the factory to maintain 10 lbs. on the system and to relieve the system when the pressure due to expansion of the water reaches 30 lbs. per sq. in.

The use of a filter is recommended when the reducing and relief valves are installed separately and comes as an integral part of the pressure governor. A filter screen of perforated copper is used in this unit to clear the water of rust, dirt and scale. The pressure reducing valve embodied in the pressure governor can also be supplied separately for use on systems consisting of tank and relief valve only. The pressure relief valve can also be supplied separately. This unit is made in two models, one being adjusted to operate at 30 lbs. pressure and the other to relieve at pressures of 50, 75, 100 or 130 lbs. per sq. in.



Sectional View of Kainer Pressure Governor and Method of Connecting

N. W. A. H. A. Will Cooperate with Coal Associations

At the meeting of the National Warm-Air Heating Association, in Columbus, December 3-4, a committee was appointed to work cooperatively with the National Coal Association. These two industries have much in common and beneficial results are expected from the work of the committee with the coal association.

Jack Stowell, special representative of the Better Business Committee, distributed through the audience an information book and sketch blanks which have been designed by the committee to facilitate making up estimates of furnace heating according to the Standard Code. These include sketch blanks and information sheets on which to note the information necessary to make up an intelligent estimate.

It was emphatically stated at the meeting that the association deems it necessary to continue the research work at the University of Illinois. This sets at rest rumors which have been circulated that the cooperative arrangement between the association and the university will soon end.

James H. Firestone, chairman of the Research Advisory Committee, outlined the research work that has been carried on to date at the university, and enumerated some of the work which the association has in mind for the future. He pointed out that only such tests as will benefit the entire industry will be carried on. It is not advisable to test specialties unless from such testings a direct benefit will result to the advantage of the industry as a whole.

Professors Willard and Kratz and Assistant Professor Konzo, of the University of Illinois, reported on recent research developments. Their report will not be released for publication until it has been published in book form by the Engineering Experiment Station of the university.

Among the tests which may be carried on under the research program, outlined by C. M. Lyman, honorary chairman of the Research Advisory Committee, are the use of trenches for return air and the effect of using all air from the outside as well as the different ratios of outside air to inside air.

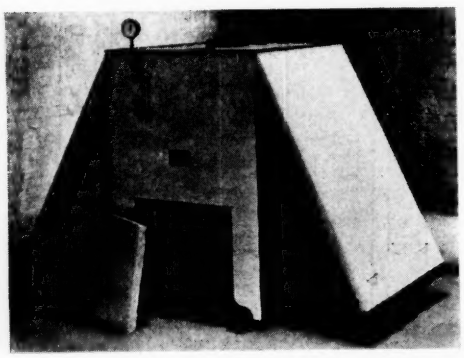
B. G. Watson reported on the recent Trade Practice Conference of warm-air furnace manufacturers, and stressed the outstanding points in connection with the organization of the Warm-Air Furnace Institute. He stated that although the rules have not yet been formally approved by the Federal Trade Commission, the institute is in actual operation and the members have been carrying on its work since December 1. He made it clear that the rules when approved by the Federal Trade Commission will apply to every furnace manufacturer, whether a member of the institute or not.

Prof. J. D. Hoffman, of the Joint Code Committee, explained that the chief changes in the Standard Code include the enlargement of Table A and a few minor changes in the construction or wording of the code.

New Apparatus and Appliances

Boiler for Oil and Gas Burning

Designed for use in connection with oil burners and gas conversion units, the Austin Rapid Generator has been announced by the Austin Heat Tranference Corp., 6 Broad Street, Port Chester, N. Y.



View Showing Construction of Austin Boiler

The heating surface is made up of coils of specially-treated wrought-iron pipe and are easy to remove.

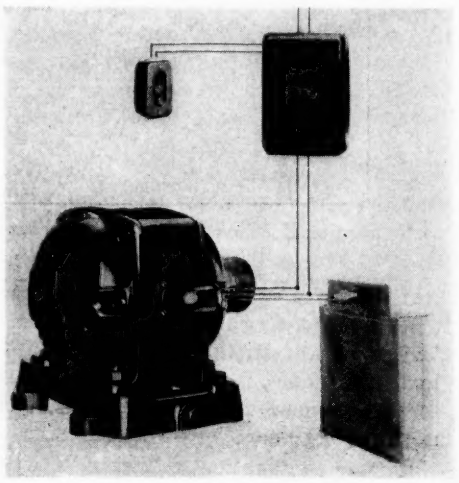
The combustion chamber is lined with refractory brick, made in large blocks, while the front panel which fits over the combustion chamber is furnished uncut so that any make of oil burner or conversion unit can be installed easily. The side panel is so hinged that if, for any reason, an explosion should occur within the combustion chamber the door will act as a safety valve and swing open so that the excess pressure is dissipated. The boilers are finished in red enamel, and can also be supplied in a marble finish.

Two gray-iron castings, the water base and steam dome, are the only other essential parts of the boiler, besides the pipe coils. The threaded parts of the coils are not exposed to the direct heat of the flame, but are protected by the insulation and fire brick.

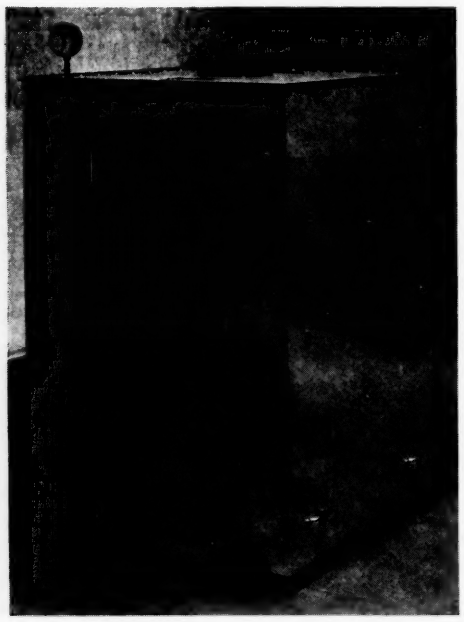
A feature of the boiler is the fusable plug, which, in case of low water, is designed to open a circuit and close the gas or oil valve, so that the flame is instantly shut off. The boiler can be supplied in two models, of 600 sq. ft. and 1200 sq. ft. of steam radiation capacity.

General Electric Motor for Fans and Pumps

A line of single-phase, squirrel-cage capacitor motors, designated type KC, especially designed for quiet operation,



G. E. Motor for Fans and Blowers



Austin Heat Generator

is announced by the General Electric Co., Schenectady, N. Y. These motors will find their principal application in driving blowers and ventilating fans on low-torque centrifugal machinery, on low-pressure pumping applications, etc.

Although the motor is classified as a single-phase machine, it is really a modified two-phase, squirrel-cage motor with a capacitor in series with one phase of the stator windings. This gives starting characteristics similar to the two-phase, squirrel-cage motor; that is, it is self-starting. The capacitor remains in the circuit throughout starting and running so that full-voltage hand or magnetic control only is required. As a result of this, single-phase pulsation is absent. In addition special slot combinations and rotor construction are used to obtain an even greater degree of quietness.

Ratings available in the new line are from 1 to 25 H.P. inclusive, at 3600, 1800, 1200 and 900 R.P.M. constant speed, with starting torque from 60 to 40% of full load running torque depending upon speed. Maximum torque is approximately 200% of full load running torque.

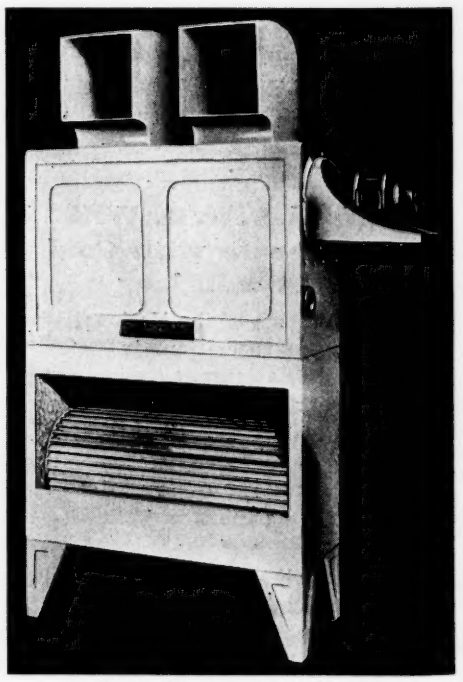
Buffalo Wetboy

A unit heater that washes and humidifies the air, the Wetboy, has been announced by the Buffalo Forge Co., Buffalo, N. Y.

In addition to heating the air, a revolving drum of air washer eliminator and scrubber plates propelled by the air current through the unit cleans and humidifies the air. Scrubber plates continually dipping in the water tank provide wetted surface through which the air must pass twice. There is no pump, no circulating piping or no auxiliary motor or mechanism. Dirt picked up from the air settles into a tank similar to the air washer. Hose connection is provided and the revolving drum can be lifted up, and the collected dirt washed out through the drain connection. The water level in the tank is maintained automatically through a float.

The heating element is made up of Aerofin tubing for pressures from 2½ to 200 lbs. gauge. The multi-rotors are of the centrifugal type, each in its own fan housing, designed to deliver a large volume of air with a minimum of noise. The complete rotor and shaft assembly can be removed through the end plates without disturbing the top of casing or fan housings.

It is claimed that the unit will remove 70% of the dirt and dust in the air, and it adds approximately 25% to 35% moisture to the air. The maxi-



Buffalo Wetboy Unit Heater

mum width is 18 in., and the unit requires no more space than the standard No. 200, 300 and 400 Buffalo Highboy unit heaters.

Emerson Furnace Fan

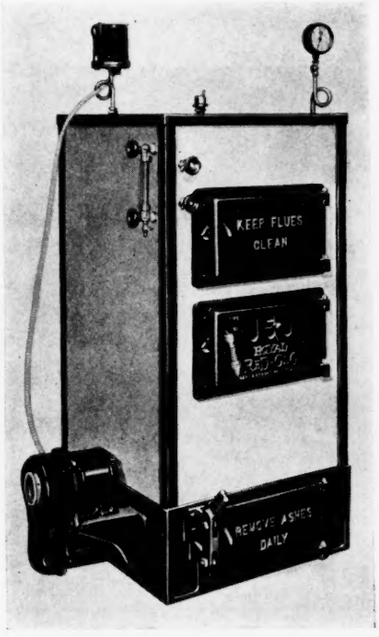
A furnace fan for forcing the warm air directly to the rooms and overcoming sluggish circulation has been announced by the Emerson Electric Mfg. Co., St. Louis, Mo. The fan has a slow speed motor to insure quietness, and the four steel blades are specially designed for quiet operation and to give a maximum velocity to the air. Wool packed bearings insure proper lubrication and have sufficient lubricant for 2000 to 3000 hrs. of service. The adjustable motor mounting is made for three different positions; horizontal and angles of 22½° or 45°, making it suitable for duct or boot installation.

Jacketed Boiler for Buckwheat Coal

While the savings possible in a domestic heating plant burning buckwheat coal, as compared with a system in which the larger sizes of fuel are used, are well known, it has remained for Hart & Crouse Co., Utica, N. Y., to place on the market a jacketed sectional boiler equipped with a blower to make possible the burning of such coal without the addition of special equipment.

The blower is an integral part of the boiler, and the boiler, blower and thermostat are furnished as a unit. The boiler is insulated on all sides by four-ply asbestos air cell covering, and covered with a jacket of cardinal red trimmed with black.

These boilers can be supplied in seven sizes with 17-in. grate, capacities from 385 to 1375 sq. ft. of steam radiation; five sizes with 26-in. grate, capacities from 1400 to 3100 sq. ft. and five sizes in 26-in. smokeless type.

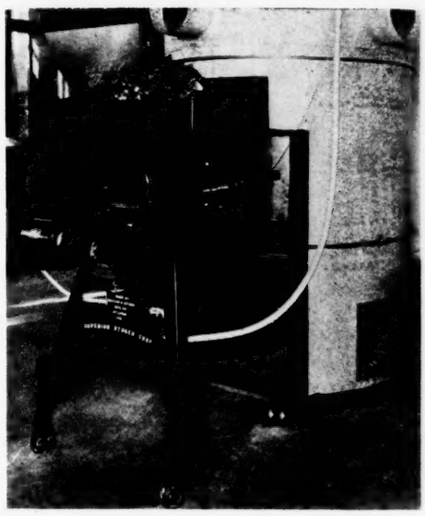


Hart & Crouse Boiler with Blower

Portable Domestic Stoker

A portable stoker mounted on castors, permitting the movement of the machine away from the furnace, is being manufactured by the Superior Stoker Corp., 4204 No. Union Blvd., St. Louis, Mo. The castors have long shanks to adjust the height of the stoker to fit various sizes of furnaces.

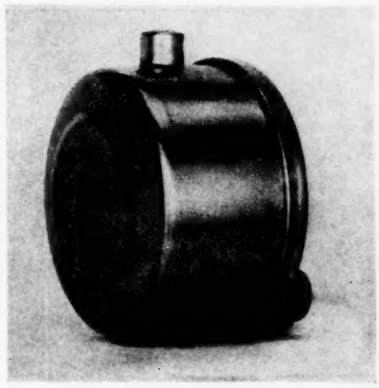
The stoker is operated by a ¼ H.P. repulsion-induction type, 1725 R.P.M. motor. The safety switch consists of a Westinghouse circuit breaker with manually operated reclosing switch. A specially designed timer is used, adjustable to a wide range of feeding and idle periods to meet the requirements of various fuels and operating conditions. The feed is adjustable from 20 sec. to 2 min. and the idle time can be varied from 1 min to 15 min.



Superior Portable Stoker

The rate of speed is approximately 3 lb. of 2-in. Illinois screenings per minute of operating time of the motor. This amount is increased slightly when smaller coal is fed and decreased when larger coal is used. By continuous operation a maximum capacity of approximately 175 lbs. per hr. can be obtained. The conveyor is of the full-floating screw type operating at 11 R.P.M. The hopper holds 250 lbs. of coal.

No changes in the interior of the furnace are necessary when the stoker is installed. The door plate is adjustable on the feed pipe as required, for various sizes of firepots or grates.



Gorton Surevent Air Valve

Air Valve for Oil-Burning Steam Heating Systems

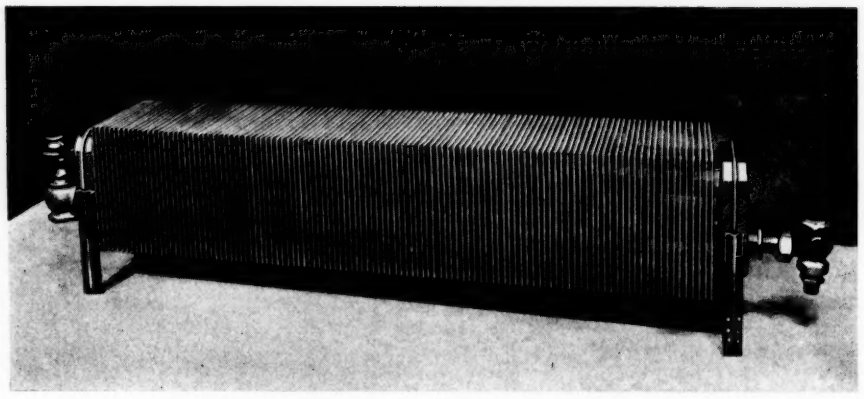
The Surevent air valve has been developed by the Gorton Heating Corp., 96 Liberty St., New York, especially to meet the conditions created in a steam heating system where oil fuel is used.

It is claimed that in such systems there is slow heating up of the radiators at the end of the main caused by the thermostatic control of the burner. The Surevent valve overcomes this condition by controlling the flow of steam to the radiators so that all units will heat up at approximately the same time. This is done by attaching the No. 5 air valve to the radiators nearest the boiler and in the thermostat room, and the No. 6 valve to the radiators in the cold rooms and those farthest from the boiler.

The valve has a large space between the valve body and float to prevent water logging. The expansive member is made of a non-corrosive metal sensitive to heat. One end is fastened to the top of the valve body and the other end is loose, allowing it to move freely up or down when it expands or contracts.

When steam enters the valve the heat causes the thermostatic metal to expand, moving the loose end up, closing the valve, and holding it closed as long as steam is in the radiator. The valves have a standard ⅛ in. connection.

Interior of Surevent Air Valve



Heating Element of Heintz Cabinet Radiators

Heintz Cabinet Radiator

A line of cabinet radiators has been announced by the Heintz Mfg. Co., 1332 Arch St., Philadelphia, Pa. The heating element is composed of seamless steel tubes welded at either end to manifolds, around which are placed extended surface in the form of fins.

The radiators can be supplied in 32 sizes, in 20, 26, 32 and 38-in. heights, and capacities ranging from 15½ to 88 sq. ft. of equivalent radiation.

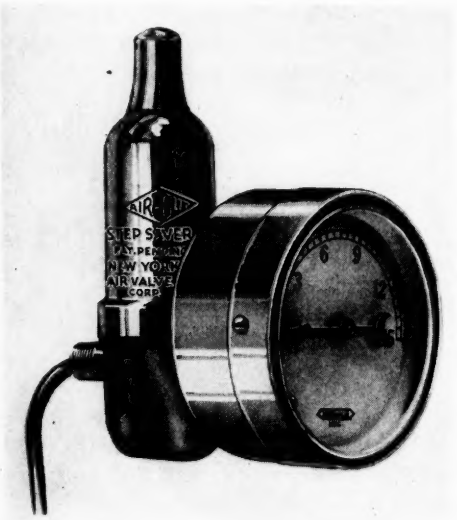
Portable Acetylene Generator

A portable acetylene generator for welding and cutting, made of light weight drawn seamless steel, has been placed on the market by the Alexander Milburn Co., 1416 West Baltimore St., Baltimore, Md.

There are no clocks or motors and but few moving parts. Carbide hopper feed control and head are assembled in one unit which can be detached from the seamless steel body by the removal of a few bolts. The carbide feed is controlled by a single valve which responds to high or low pressure and automatically stops if the pressure is at zero, if the filler plug is open, or if the generator is not properly closed. The generator will stand tests of usage, upsetting and tipping without causing a rise in pressure of the gas or abnormal working of the machine. It is equipped with blow-off valves, pressure control, safety gas purifier and strainer. It is made in three sizes, 35 lbs., 70 lbs. and 100 lbs. capacity.

Combined Air Valve and Steam Gauge

In order to eliminate the necessity for the home-owner descending to the basement to determine the steam pressure on the boiler, Frank Bros. Mfg. Co., 476 Broome St., New York, has placed on the market the Air-Out Step-Saver. This device can be attached to any radiator in a convenient location, so that the steam gauge will show the exact pressure in the radiator. The Air-Out Syphon Air Valve vents the radiator and, in combination with the gauge, indicates the steam pressure. Due to the construction of the base casting, it is not necessary to use the pig tail syphon to protect the spring in the steam gauge.



Air-Out Air Valve and Steam Gauge

Storage Water Heater Small Family Job

A modified design of the storage water heater for the small apartment house and private residence job, has been announced by the Davis Engineering Corp., 90 West St., New York.

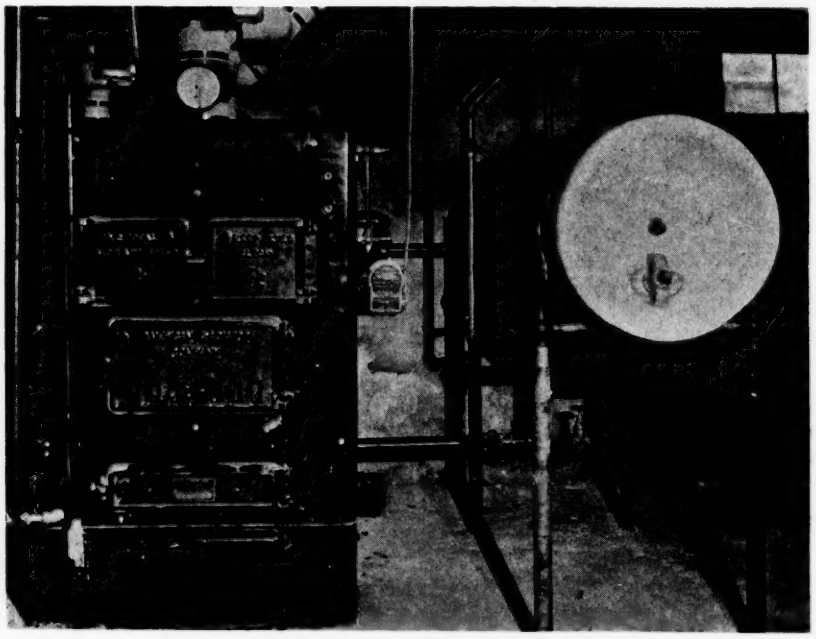
The heating element is located within the storage tank, so that the heating is accomplished within the tank. This eliminates the additional circulating lines which frequently clog and interfere with proper heating. In addition to the low initial cost of the unit, less piping is used, resulting in a saving in both material and labor.

With the submerged storage heater installed below the water line, heating will continue when fires are banked. In summer it is only necessary to operate the boiler at a slow rate and, without generating any steam, hot water demands are satisfied.

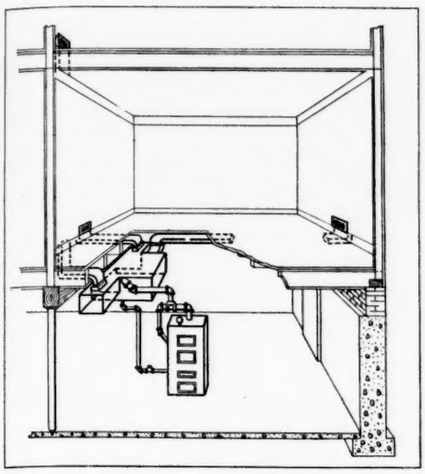
For oil-fired boilers, an inexpensive attachment will maintain hot water in the storage tank at a fixed temperature with saving of fuel over the separate summer heating method.

This type of storage heater installed below the water line of a steam boiler is advantageous where cellar excavations are difficult and expensive, for the headroom required for the installation of the boiler is usually sufficient for the storage water heater as well, no added cellar depth being necessary for that apparatus.

The sizes of the small type storage heaters vary from 14 to 30 in. in diameter and from 60 to 96 in. in length. They are made in eight sizes with capacities ranging from 40 to 300 gallons. The size of the circulating lines to the boiler range from 1 to 2 in. for steam systems, and from 1¼ to 2½ in. for water systems.



Storage Tank for Small Family Installation



Harwin Unit Heater

Harwin Home Unit Heater

A system which introduces filtered and humidified warm air into the room has been announced by The Harwin Heater Co., New Haven, Conn. The system consists of the unit heater, which is supplied with steam from the steam boiler, a copper condenser of high radiating capacity being used in the heater.

A quiet-operating blower in the heater forces filtered air through the heating element over a self-filling automatic humidifier, into the main duct and branches which are concealed between the floor joists and wall construction. The warm air enters the room through a small damper grille set flush with the wall, and circulates through the room before it enters the re-circulating grille on the opposite side of the room, and is led back to the filter chambers where it is filtered before entering the blower again. The unit heater is equipped with automatic controls for either coal, oil or gas-fired systems.

Air Conditioning Unit for Homes

A unit for cleaning, humidifying, and supplying forced circulation to the air in connection with a warm-air furnace, is being manufactured by A. Gehri & Co., Tacoma, Wash. The unit is equipped with a three-speed fan and motor, an electric automatic solenoid water valve, and an air washer unit. A thermostat and humidistat are furnished as separate units.

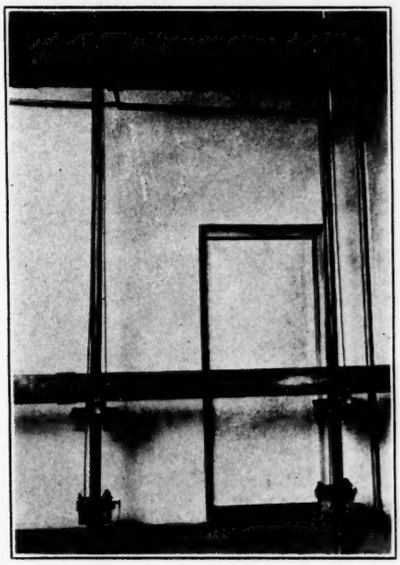
Air washers are equipped with valve, piping spray nozzles, pressure gauge and an electric solenoid valve which is controlled by a thermostat.

The fan is of a quiet, slow-speed centrifugal type. Units are available in nine sizes with capacities ranging from 800 to 4600 cu. ft. of air per min. on low speed, 920 to 5600 C.F.M. on second speed and 1080 to 6300 C.F.M. on high speed. The capacities of the washers range from 14 to 84 gal. per hr. on low speed and from 18 to 96 gal. per hr. on second speed.

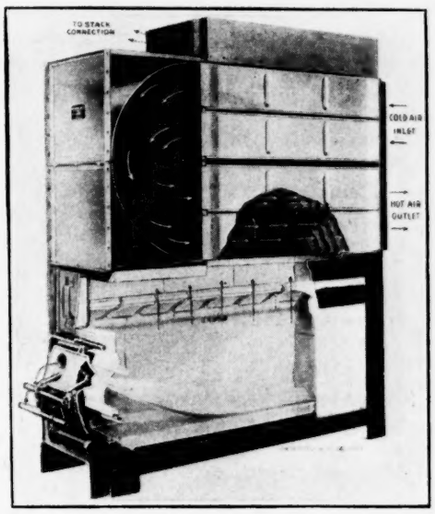
Giant Twin Lift

A device for lifting pipe and radiators to the ceiling for installation has been placed on the market by the Giant Twin Lift Co., 2110 So. Corona St., Denver, Colo.

Two pieces of 2-in. pipe, 14 in. less than the distance between the floor and ceiling, are cut, after which the fittings, supplied by the manufacturer are attached. As much as 1000 lbs. can be raised within 4 in. of the ceiling. It is stated that perfect alignment and adjustment can be made easily and without hazard. No scaffolding, block or tackle are needed. The manufacturer estimates that from 1% to 2% on every job is saved in labor.



Giant Twin Lift, Lifting Pipe into Position



Industrial Heating Unit

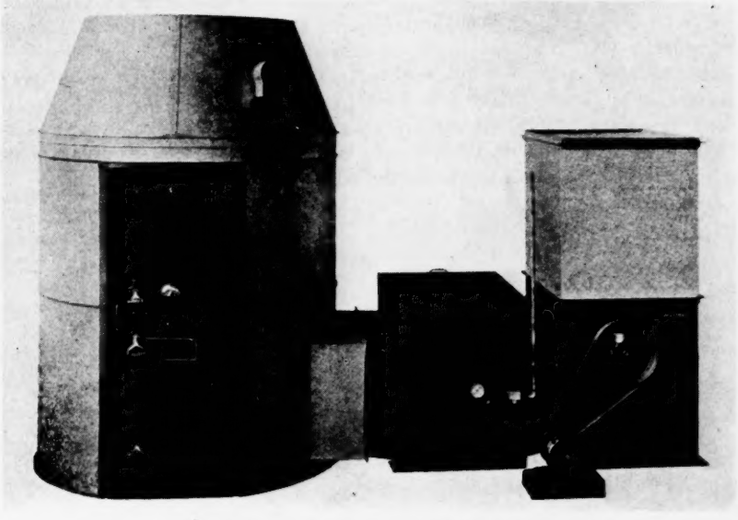
Oil-Fired Heaters for Airplane Hangars

An oil-fired self-contained heating system for factories, and especially airplane hangars, has been introduced by the Nichols Products Corp., 12953 Greeley Avenue, Detroit, Mich. The system consists of the heaters with enameled tubes, a constant level control tank, automatic cutoff, pressure regulating valve, pressure gauges, an air compressor, air tank, supply fan, air ducts, and an oil storage tank.

The warm air is distributed through sheet metal trunk lines designed to conform with the installation.

Phantom Stoker

A stoker operating on the overfeed principle has been announced by The Phantom Stoker Co., 1410 Superior Ave., Cleveland, O. A draft of pre-heated air is injected by a fan with the coal, a small motor thermostatically controlled furnishes the power to operate the stoker.



Gehri Silentair Air Conditioning Unit

The hopper, which is made of heavy metal, will hold 210 lbs. of coal. Bronze and steel reduction gears are driven by a 1/6 H.P. motor which drives a coal pusher for firing the fuel to the furnace. The stoker is supported by an arm which allows the unit to swing in and out of the furnace as desired. The heat is adjustable so that the quantity of coal fed can be varied easily. The air inlet is equipped with an adjustable disk to insure the proper amount of air for combustion.

Simplex Variable Pressure Steam Heating System

Simplex Heating Specialty Co., Inc., Lynchburg, Va., has developed a variable pressure steam heating system, in which the steam supply valves to the radiators are fitted with restricted orifices. These orifices are made of nickel steel, carefully sized for each particular size of radiator. The diameter of these orifices is so small that it requires some pressure to pass any appreciable quantity of steam through them into the radiator.

Use of a restricting orifice in individual radiator supply valves has produced two important results. First the restricted inlet causes a uniform distribution of steam between all radiators in the system, regardless of the distance from the boiler, even when the steam supply is limited, as when the fire has been banked or allowed to go down.

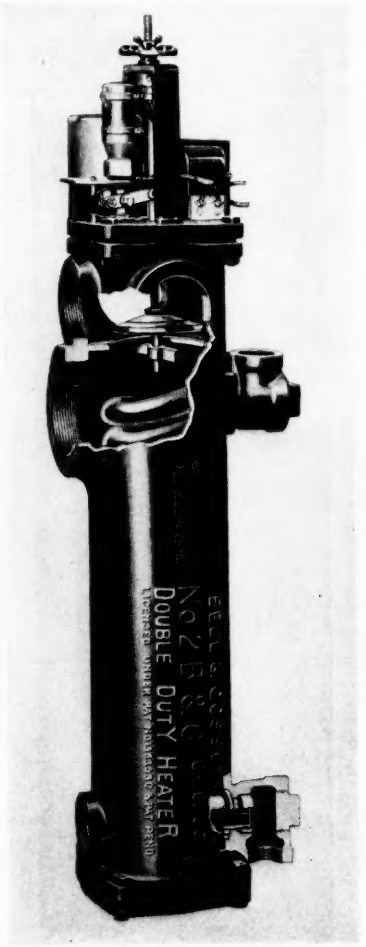
Second, restricted steam supply provides means for obtaining a variable rate of heating to meet the demands of varying outside temperatures or weather conditions, effecting a saving in fuel and resulting in comfortable conditions.

In this system orifices in the radiator supply valves reduce the steam inlet area to approximately one-thirtieth of the average area through ordinary radiator valves as now used in modern two-pipe work, and the system operates at a pressure from 0 to 8 lbs., according to requirements.

Pressure carried in the heating mains is determined by a combined temperature and pressure chart placed at a point convenient for the attendant, and a similar chart with special temperature and pressure gauge is placed in the office of the building superintendent.

Indirect Water Heater for Hot Water Boilers

Announcement of an indirect water heater adapted to oil or gas-fired hot water boilers has been made by Bell & Gossett, 3000 Wallace St., Chicago. Indirect heaters have been heretofore limited to steam or vapor heating boilers, due to the lower temperatures carried in water boilers. The new Double Duty heater operates so that boiler temperature is not regulated by the room thermostat. A water limit control maintains a constant boiler temperature between 150° and 170°. Under these conditions the heater allows circulation around the copper coils in which domestic water is indirectly heated and automatically maintained at 140°.



Bell & Gossett Water Heater

The room thermostat, under this arrangement, controls the main valve to the radiator lines. This valve, operated by a vapor motor, is an integral part of the Double Duty heater. Thus, in maintaining a constant hot water supply, boiler water is available on demand by the room thermostat to supply immediate heat. This is shut off as soon as room temperature is raised sufficiently.

Exhibits Wanted for Exposition

An appeal is being made by the manager of the forthcoming International Heating and Ventilating Exposition for information which will lead to the location of both historical and educational exhibits which could be used during the progress of the exposition in the special section which is being set aside for this purpose.

Any such information will be appreciated by Charles F. Roth, manager of the exposition, Grand Central Palace, New York.

Index for 1929

The index for Volume XXVI, January to December, 1929, which appears on pages 52-57 in this issue, is also ready for distribution. A copy will be mailed upon request to the Circulation Department, HEATING AND VENTILATING, 521 Fifth Avenue, New York.

Gas House-Heating Shows Increase in Illinois

An increase of 26.7% in the amount of gas used for house-heating in Illinois the first nine months of this year, as compared with the same period in 1928, is reported.

Reports from seven Illinois gas companies, whose sales constitute 78% of the total sales of gas in the state, show not only this increase in volume, but also that at the end of September of this year there were 61% more homes equipped for this method of heating than there were a year previous.

Margaret Ingels Joins Carrier-Lyle Organization

Margaret Ingels, who has spent six years as research engineer in the A.S.H.V.E. Research Laboratory at the United States Bureau of Mines in Pittsburgh, has become associated with the Carrier-Lyle Corporation of Newark, N. J. Miss Ingels, as America's first woman air-conditioning engineer, will engage in sales promotion work in connection with women's clubs and state organizations. She received her M.E. degree at the University of Kentucky, is a member of the A.S.H.V.E., and was secretary of the Pittsburgh Chapter, 1925-27.

Margaret Ingels

SCOTTISH RITE CATHEDRAL

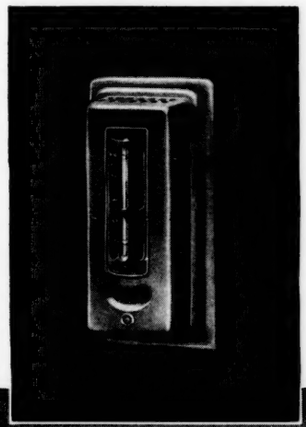
Indianapolis, Ind.

Architect
GEORGE F. SCHREIBER

Engineers
BEVINGTON & WILLIAMS

Heating Contractors
HAYES BROS., Inc.

The Powers Type D Thermostat



One of the most beautiful works of architecture completed in this country during 1929 was the magnificent Cathedral shown above.

Rising to a height of 210 feet the central tower houses a carillon of 63 bells, weighing 28 tons. Inside the building are numerous lodge halls, a banquet hall seating 2,500 people who can be served at one time; and a $50,000 pipe organ in an auditorium seating 1,200 people.

Reared to withstand "the fury of the elements and the ravages of time," the quality of the mechanical equipment in this edifice is in keeping with the building itself.

In selecting the Powers System of Temperature Control to regulate the heating and ventilating apparatus the architect and engineers have done everything possible to insure maximum comfort and fuel economy. Powers Control usually costs more. It's worth more. Because it often gives 15 to 20 years of accurate, dependable control without repairs of any kind.

THE POWERS REGULATOR CO.

35 Years of Specialization in Temperature Control

Chicago: 2718 Greenview Ave. • *Offices in 35 Other Cities* • New York: 137 East 46th Street

The Canadian Powers Regulator Co., Ltd., Toronto, Ont.

POWERS

New Trade Publications

Oil Burning

Your Guide to Oil Heating Satisfaction has been received from Oil Heating Institute, 342 Madison Ave., New York, to present information on the 23 oil burners and accessories manufactured by members of the institute. Each page carries a general view of a burner installation, a separate view of the burner itself, and an outline, dimensional sketch of the burner. Data are given regarding draft, fuel, tank, atomizing, ignition, consumption, chamber, motor, and models. Equipment pages show controls, pumps, motors and tubing. Size 8½ in. x 11 in. Pp. 24.

Beginning a New Era in Oil Heating is the title of a booklet received from Electrol, Inc., 227 East 45th St., New York, devoted to the subject of the new management of Electrol, Inc. Electrol's creed and pledge to the industry and its dealers are given, together with a short history of Electrol, which is interestingly told.

Preferred Utilities for Oil-Burning Systems is the title of a 64-page illustrated catalog issued by the Preferred Utilities Mfg. Corp., 33 West 60th St., New York. About 150 devices for use with oil-burning systems are shown and described. This comprehensive catalog further contains a book section and a data section; the latter gives much information valuable to the engineer and contractor. Size 9 in. by 12 in. Pp. 64.

Bulletin No. 15 was recently issued by Wm. W. Nugent & Co., 410 N. Hermitage Ave., Chicago. Nugent oiling and filtering systems, oil filters, telescopic oilers, oiling devices, sight feed valves, compression union fittings, oil pumps, etc., are described in this catalogue, and an illustration of a Nugent oil filter in Hopewell, Va., which has a capacity of 9200 gals. per hr., is included. The Nugent oiling and filtering systems also are used in the 3000-room Stevens Hotel in Chicago. Size 8½ x 11. Pp. 48.

Why Should You? is the question asked in a folder received from the Sundstrand Engineering Co., Rockford, Ill., especially prepared for the consumer. The folder is devoted to the Sundstrand Model "A-2" all-electric oil burner, and includes a sectional view of an installation, illustrations and short descriptions of the various parts making up the burner.

Quaker Burnoil Heaters is the title of catalog 32, the latest publication of the Quaker Mfg. Co., 215 North Michigan Ave., Chicago. Descriptions are given of the company's line of oil heaters for dwellings and other buildings. A parlor stove, a utility heater, a water heater, and a garage heater make up the line illustrated and described in the catalog.

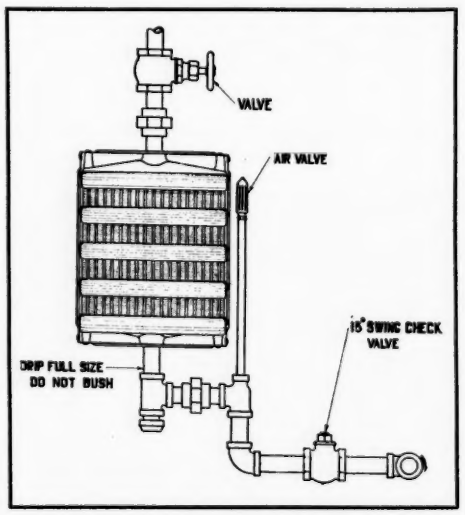
Heat at Command is the title of a catalog issued by International Combustion Equipment Corp., Bridgeport, Conn., describing the "Good-speed" automatic oil burner. This burner is a gas-ignited device with automatic control. Where it is found advisable to run with high or low flame instead of the on and off method, this system can be adapted. The burner will automatically maintain a flame of constant density controlling the air pressure.

A New Standard in Home Comfort is the title of a folder issued by the Grant Oil Burner Corp., 30 Church St., New York. Detailed information concerning the various parts of the Grant Oil burner is given, together with illustrations of the burner, and homes in which the Grant oil burners are installed.

Cook Dependable Fuel Oil Gauge is the title of a folder issued by the Cook Electric Co., 2700 Southport Ave., Chicago, Ill. The type K fuel oil gauge is described, together with an illustration of the gauge and a detailed diagram of a typical outside tank installation.

Unit Heaters

Venturafin Method of Heating for floor, wall or ceiling mounting is the subject of bulletin No. 7818, issued by the American Blower Corp., Detroit, Mich. The various Venturafin unit heaters and their component parts are described and illustrated in detail. Piping and installation diagrams of the unit heaters are given together with capacity tables, application notes and a chart to determine air volumes. Size 8½ in. x 11 in. Pp. 24.



Piping Diagram, Venturafin Unit Heater, Gravity System

Heat-Diffusing Units is the title of a new catalog issued by the York Heating and Ventilating Corp., 1541 Sansom St., Philadelphia. This bulletin, which is of real engineering merit, includes photographs showing smoke bomb test in a plant in which York unit heaters were used. Descriptions of the construction details, with copious illustrations, are attractively presented. Capacity tables and graphs for the various units, dimension and capacity tables and drawings, piping connections, motoring and wiring details, instructions for estimating heat requirements, typical specifications, and layouts are among the features of the book. Size 8½ in. x 11 in. Pp. 36.

Gas Heating

Architects' Handbook, Ideal Gas Boilers, has been received from the American Gas Products Corp., 376 Lafayette St., New York. In addition to the usual illustrations showing the line of gas boilers, together with their construction features, this handbook includes a colored cutaway view of an Ideal boiler, pointing out the special features. There are especially valuable data in the book for use in estimating hot water supply when gas boilers are used. The book is attractively designed and filled with valuable information. Size 8½ in. x 11 in. Pp. 20.

Hot-Kold Data Sheets, totaling 13, have been received from the General Iron Works Co., Cincinnati, O., and cover that company's gas-fired furnaces. Sheets Nos. 1—1A contain general information on the Hot-Kold heating, ventilating and air conditioning system. Sheets Nos. 3—3B are devoted to installations, details and notes on the planning of the job, while sheet No. 11 is captioned "How to Specify Hot-Kold." The remaining data sheets are taken up with technical information, tables of sizes and diagrams of typical systems.

Effortless Heat is the title of a new folder issued by the House Heating Division of the Consolidated Gas Company of New York. In addition to the story contained in the folder, twelve 7 in. x 5 in. photographs are included, showing houses in and around New York which are heated by gas. A caption in the corner of each print gives the name and address of the owner, the amount of radiation and the total cost of gas heating for the year. The folder is unusually effective as a consumer appeal.

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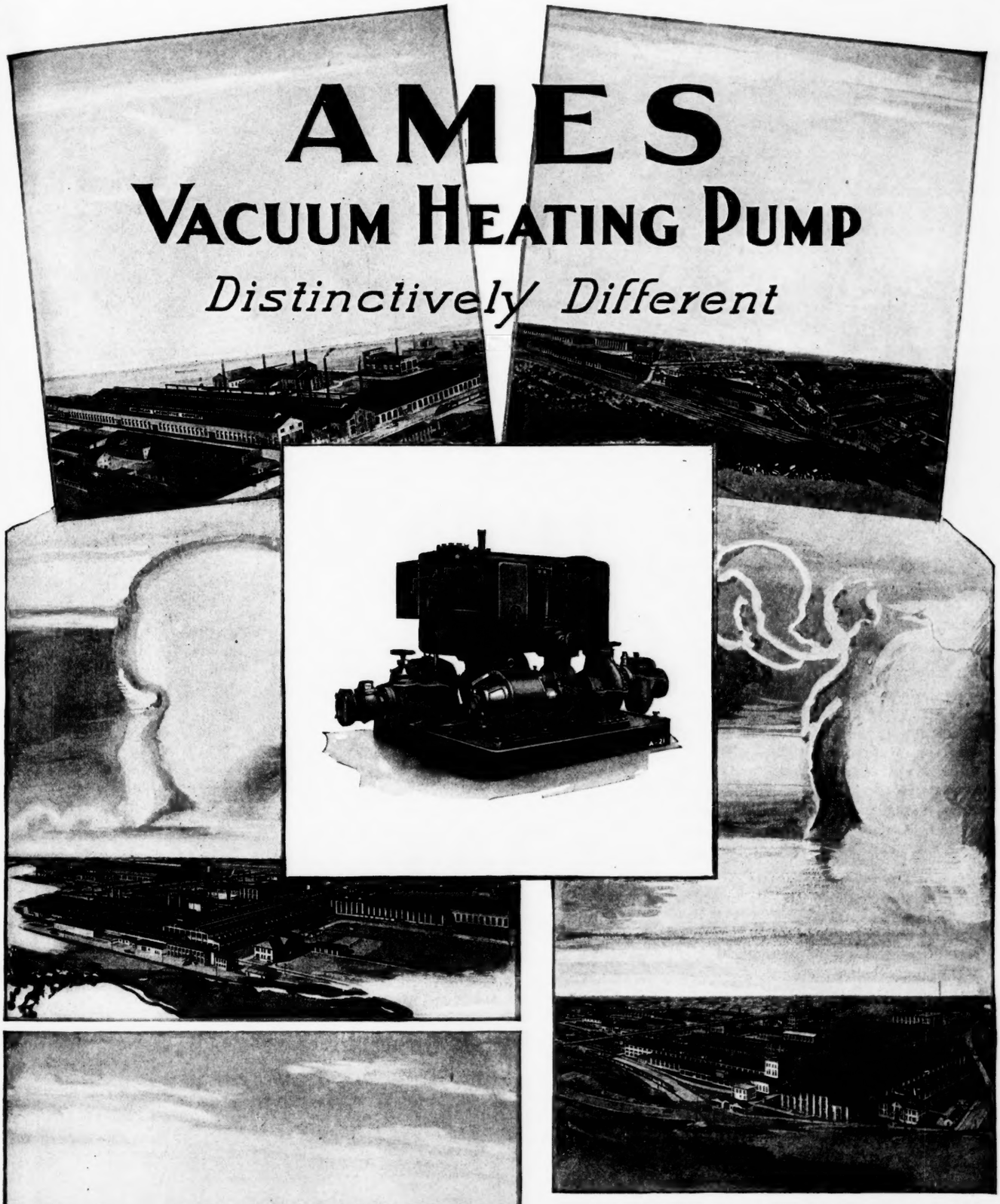
VACUUM HEATING PUMP
Distinctively Different



AMES PUMP COMPANY, INC
30 CHURCH STREET • • NEW YORK
Affiliated with and Products Manufactured by
AMERICAN LOCOMOTIVE COMPANY

Controls

Locke Regulators, the title of catalog No. 50, recently issued by the Locke Regulator Co., Salem, Mass., introduces a new line of Locke regulators. The catalog is divided into seven parts; hydraulic regulators for controlling fuel and air supply to boiler furnaces; combination pressure regulators for controlling the flow of steam, air, gas, water or oil; balanced valves and self-contained automatic pressure reducing regulators; pump governors; tank and float valves; temperature regulators, and engine and turbine stop equipment. A description and illustration of each regulator is included, together with dimensional data, a steam flow chart, and complete price list. Size 7½ in. x 10½ in. Pp. 72.

"States" Time and Remote Control Switches, manufactured by the States Co., Hartford, Conn., are described in detail in a catalog received from that company. Wiring diagrams, illustrations and descriptions are presented. In addition to heating installations, the switches are used in connection with street lighting, two rate-meter service, automatic sub-stations, electric signs and panels, drinking water systems, and electrically driven refrigerating plants. Size 3¾ in. x 6¾ in. Pp. 40.

Sheer Comfort is the title of a dealer broadside being distributed by the H. M. Sheer Co., Quincy, Ill. In addition to telling of the features of Sheer temperature control, the broadside tells of the national advertising in weekly and monthly magazines being carried on by this company.

Automatic Dual Control Unit, a folder received from H. A. Thrush & Co., Peru, Ind., includes an illustration and description of the dual control relief valve and the pressure reducing valve, both of which make up the automatic dual control unit. Detailed diagrams of three installations are given, together with prices of the relief valve, the reducing valve and the complete unit with and without strainer.

Heating Systems

Webster Vacuum Systems of Steam Heating are presented in Bulletin S-500-C issued by Warren Webster & Co., Camden, N. J. Instructions for the operation and maintenance of the Webster systems emphasize the importance of getting and keeping both boiler and system thoroughly clean. Full-page diagrammatic layouts of the Webster vacuum system in conjunction with a high-pressure and a low-pressure boiler plant are included. Diagrams show methods of connecting vacuum pump, feedwater heater, and single-control, hydro-pneumatic tank for air separating tank. Size 8 in. by 10½ in. Pp. 22.

Instructions for installing Webster type "R" modulation systems of steam heating are contained in another catalog (Bulletin S-650). An elevation of a typical Webster type "R" modulation system showing location of the equipment, and a conventional arrangement of piping around the boiler-return traps are shown. Size 8 in. by 10½ in. Pp. 14.

Thrush Electric Water Circulator is the subject of a folder received from H. A. Thrush & Co., Peru, Ind. The folder includes a short description of the operation, a detailed diagram of a circulator installation and prices of the unit, which is made in two sizes, one designed for 2500 sq. ft. of radiation, and the other for 6000 sq. ft.

Insulations

Laboratory and Standard Construction Test Data of Heat Transfer through Sprayo-Flake Insulation is the title of a bulletin received from the Sprayo-Flake Co., 56 South Bay Street, Milwaukee, Wis. This book was designed for the use of architects and engineers and contains copies of letters by G. F. Gebhart, Frank B. Rowley, and S. R. Lewis, giving the results of their tests on Sprayo-Flake insulating material. Drawings showing various types of walls with which Sprayo-Flake has been used are presented, together with their heat loss coefficients.

Cork and Insulation are treated in a booklet issued by the United Cork Companies of New York, Lyndhurst, N. J. The booklet, which is divided into two sections, gives general information on cork insulation, advantages of corkboard, savings effected by the use of corkboard, together with a table of thicknesses and illustrations of buildings in which corkboard is installed.

The second section is devoted to detailed specifications covering practically every type of construction that may be employed in insulating old as well as new buildings. The information and figures contained in the booklet are especially complete, and should prove most valuable to those interested in this subject. Size 8¾ in. x 11 in. Pp. 84.

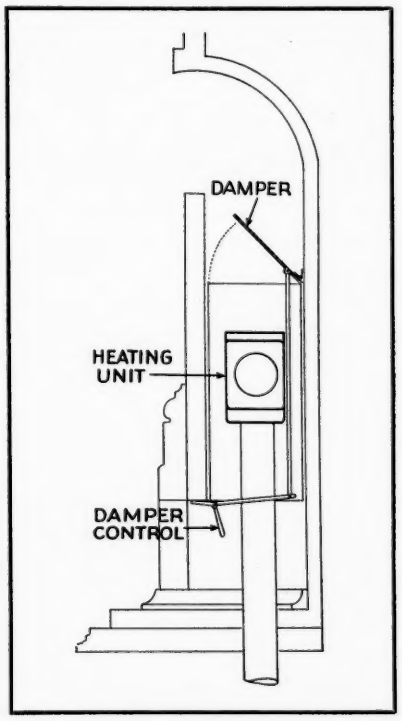
Data and Details for the Application of Armstrong's Cork Machinery Isolation are offered in a folder received from the Armstrong Cork & Insulation Co., Lancaster, Pa. This material is supplied in boards 12 in. wide, 36 in. long and thicknesses ranging from 1 in. to 6 in. The folder describes the installation, and gives an example of a calculation for an installation of material, together with samples of particular uses of the installation for deadening sound.

Radiation

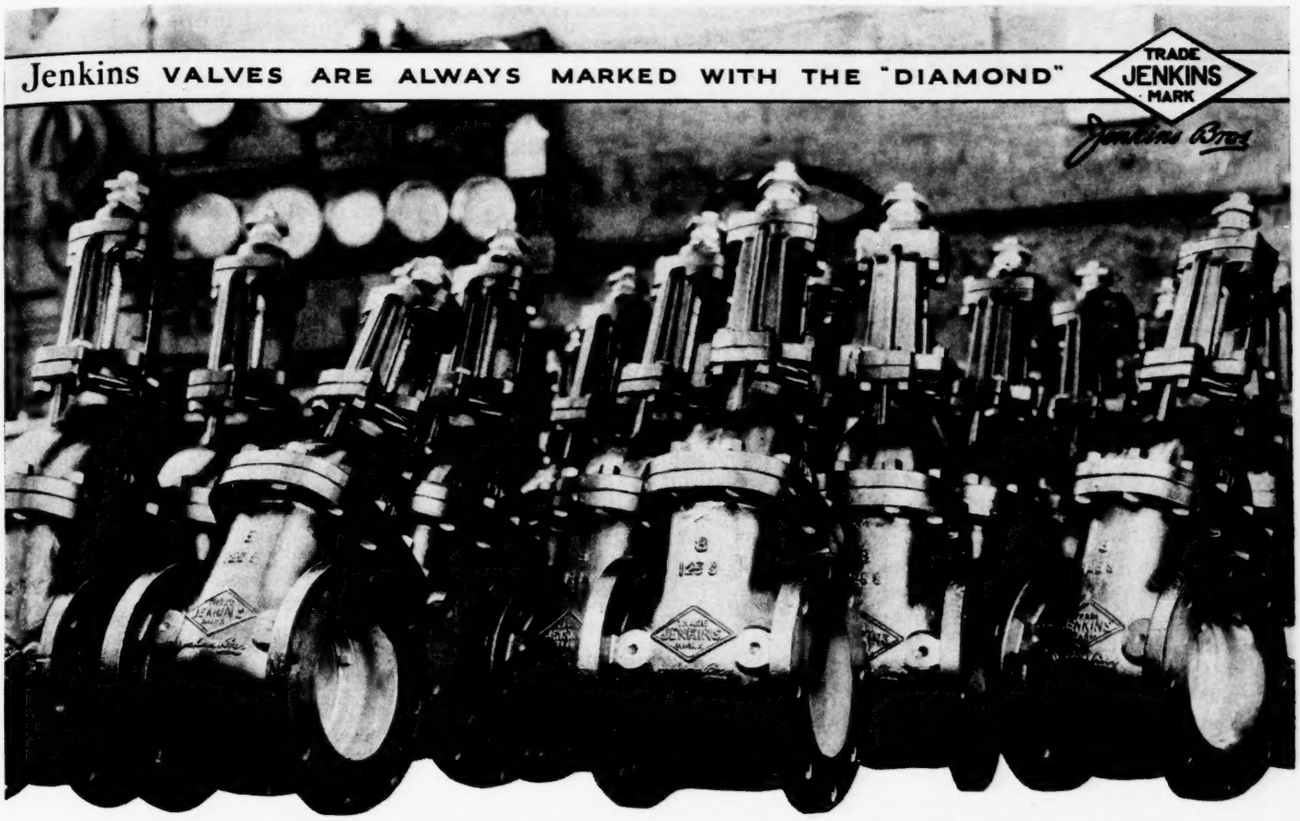
Moore's Patent Pressed Steel Adjustable Radiator Brackets are described and illustrated in a folder published by Carty & Moore Engineering Co., Inc., 611 W. Larned St., Detroit, Mich. Prices for all types of radiators are included, together with detailed diagrams showing measurements and adjustments.

Super-Fin Fan Blast Radiation is the subject of a catalog published by the York Heating and Ventilating Corp., 1541 Sansom St., Philadelphia. The physical characteristics of the Super-Fin tubes and sections are described and attractively illustrated. Complete capacity and performance tables of the Super-Fin radiation under various pressures, various air temperatures, and various velocities are given, together with complete engineering data, tables and piping diagrams. The material is easily found, attractively presented, and altogether the catalog is one of the best which has been issued on this subject. Size 8½ in. x 11 in. Pp. 36.

The Vulcan Radiator is the title of an 8-page booklet published by the Vulcan Radiator Co., 73 Homestead Ave., Hartford, Conn. The Vulcan is an extended surface radiator made of a series of stamped plates securely fastened to a tube of ductile metal. It is furnished with a sheet steel enclosure complete. The enclosure has a cold air inlet at the bottom, a control damper and operating mechanism, an outlet elbow and grille. This radiator can be furnished in either 3½-in. or 7-in. widths, with heights of 20 in., 25 in. and 30 in., and in six lengths from 19 in. to 49 in.



Arrangement of Control Damper, Vulcan Concealed Radiator



A shipment of 8 inch Fig. 651, Jenkins Standard Iron Body Gate Valves with outside screw and yoke and rising spindle.

Building business with Jenkins Valves

From small bronze valves that fit in your fist to huge iron bodies like those shown . . . whatever the job requires, it pays to put in a Jenkins.

To install Jenkins Valves is to add the final touch of quality to good plumbing. It builds owner satisfaction and strengthens the contractor's reputation.

For 65 years the name of Jenkins has been accepted as a guide to valve performance that is long and efficient. Jenkins are obtainable through supply houses everywhere.

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Factories. Bridgeport, Conn., Elizabeth, N. J., Montreal, Canada

Jenkins
VALVES
Since 1864

Pipe

Arco Metal Pipe, now in quantity production, is described in a catalog issued by the American Radiator Co., New York. Made of ni-chrome alloy iron and cast by a special process, the new product has threaded joints and is remarkable for its corrosion-resisting qualities. Arco metal pipe now is available in 1½ in., 2 in., 2½ in., 3 in., 4 in., 5 in. and 6 in. sizes, with the same outside and inside diameters as extra-strong wrought-steel or iron pipe. Larger sizes will be available later. Standard tools can be used to cut and thread this new pipe, while reaming after cutting is not necessary. Photographs, sketches and text describe applications of Arco metal pipe, nipples and couplings. Size 8½ in. x 11 in. Pp. 8.

Design Standards for Oxwelded Steel and Wrought Iron Piping have been published by the Linde Air Products Co., 30 E. 42nd St., New York. This booklet, the first of a series, is designed to furnish handbook information on the fundamental designs used in oxwelding steel pipe, which also apply to wrought iron pipe. It includes line welds, welded flanges, welded fittings and welded headers.

The appendix of the booklet includes tables of dimensions, weights and expansion, together with tables of results of strength tests of welded pipe joints in all commonly used commercial sizes of pipe. Specifications for welded piping, prepared by the Linde Air Products Co., and a glossary of terms used in welding practice are also included in this complete and informative booklet which is profusely illustrated. Size 6 in. x 9 in. Pp. 67.

Youngstown Pipe is the subject of a booklet issued by the Youngstown Sheet and Tube Co., Youngstown, O., which includes a brief description of manufacturing processes, tables giving useful data on tubular materials, and notes on the handling of such materials on the job. A brief, illustrated, nontechnical description of the processes used in the manufacture of welded and seamless pipe is given in the back of the book, together with technical data on dimensions, weights, threads, etc. Size 4½ in. x 7¼ in. Pp. 61.

Water Heating

Heating Water With Water is described in a catalog of McDermott Water Heaters, Inc., 101 Park Ave., New York. Prepared especially for the New York trade, the booklet shows a large number of typical New York installations of McDermott submerged water heaters. One of the interesting chapters in this catalog is "How a Grate 7 Inches Square Raises 414 gals. of Water 100° Every 4 Hours." Numerous illustrations of buildings in New York in which these heaters are used and letters of endorsement from their owners are included.

Weatherstrip

Monarch Metal Weatherstrip Manual for Architects, Heating Engineers and Building Contractors has been published by the Monarch Metal Weatherstrip Corp., St. Louis, Mo. The information is intended to give the architect and engineer complete data on the standard methods employed in equipping the ordinary types of windows and doors with Monarch certified metal weatherstrip, and to show by means of diagrams and photographs the advantages of this weatherstrip in saving fuel. Size 8½ in. x 11 in. Pp. 16.

Valves

A Series of Aquatint Brochures, issued by Jenkins Bros., 80 White St., New York, are a splendid example of the use of art in heating equipment advertising. These folders contain a historical resume of the architectural development of different types of structures, including hospitals, office buildings, hotels, schools, stores, and industrial plants. Included with each brochure is a loose sheet showing Jenkins gate and globe valves in color. Size 8½ in. x 11 in.

Valves and Fittings are described and illustrated in catalog No. 330, issued by the Reading Steel Casting Co., Bridgeport, Conn. The catalog contains complete information on the line of Pratt & Cady globe and angle valves, gate valves and check valves, in bronze and iron, hydraulic operated valves, steel gate valves, cast steel flange fittings, screwed fittings, etc. Dimension tables and engineering information are included in the back. Size 6 in. x 9 in. Pp. 264.

Usav Air and Vacuum Valve is the subject of a folder received from the U. S. Air & Vacuum Valve Co., New Haven, Conn. The folder contains information on the operation of the valve, the saving in fuel effected by its use and how it is installed, together with illustrations showing its construction.

Foster Valves are described and illustrated in catalog No. 60 by the Foster Engineering Co., Newark, N. J. The catalog treats on the full line of relief valves, pump governors, pressure reducing regulators, and special and miscellaneous valves and appliances made by this company. Size 7¾ in. x 10¾ in. Pp. 94.

Pumps

Useful Information and Miscellaneous Tables are contained in a booklet published by the Chicago Pump Co., 2300 Wolfram St., Chicago. Data for the determination of capacities of bilge pumps, sewage ejectors, domestic hot water circulating pumps, gravity tank house pumps, and pneumatic water systems are given for apartments, hotels and clubs, hospitals, mercantile buildings, office buildings and schools. In addition to this there are curves showing the suction lifts of varying temperatures, flow of air through various orifices under vacuum, table of theoretical horsepower required to raise water to different heights, friction of water in pipes and other data useful to the engineer or contractor who specifies or installs pumps.

Westco Condensation Pumps and Receivers are the subject of a folder recently issued by the Westco-Chippewa Pump Co., Inc., Davenport, Ia., which contains an illustration of the unit, a diagram of the pump construction, selection and dimension tables.

Soldiers' Field Stadium Uses "Chicago" Pumps is the title of a folder received from the Chicago Pump Co., 2336 Wolfram St., Chicago, Ill. Twelve Chicago pumps were selected to supply adequate sanitary disposal facilities needed when 150,000 people are congregated in less than one sixteenth of a square mile.

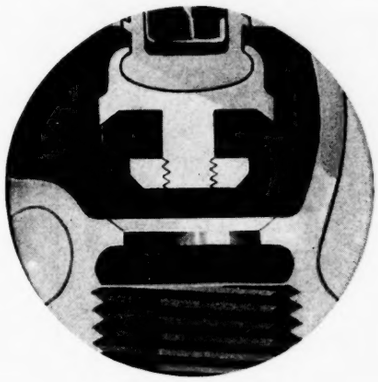
Instruments

Bristol's Recording Psychrometers appears on the cover of a 16-page booklet issued by the Bristol Co., Waterbury, Conn. Descriptions of the instruments, the charts and their uses are presented. Some of the places where recording psychrometers are used include dry kilns for wood, drying of clay products, textile drying and weaving rooms, rooms where camera films are made, tobacco curing rooms, ventilating ducts in schools and public buildings, etc.

Uehling Barometer and Vacuum Recorder for Steam Turbines is a six-page bulletin, No. 150, published by Uehling Instrument Co., 473 Getty Ave., Paterson, N. J., describing the company's latest instrument and including engineering data, and two full-page reproductions.

Tagliabue Recorders and Dial-Indicating Thermometers are featured in a recent catalog, No. 905C, received from C. J. Tagliabue Mfg. Co., 18 33rd St., Brooklyn, N. Y. The catalog is more than a conventional listing of thermometers, pressure and vacuum instruments and recorders, in that it begins with several practical stories telling why recording thermometers should be used. Size 8½ in. x 11 in. Pp. 106.

Marsh Cone Discs, the greatest improvement in radiator valve construction since the composition disc replacing the old style metal-to-metal disc and seat, **are original, distinctive and exclusive** with the **Marsh Valve Company,** of Dunkirk, New York, and are offered to the **trade only and exclusively** through its Sales Organization and Distributors.



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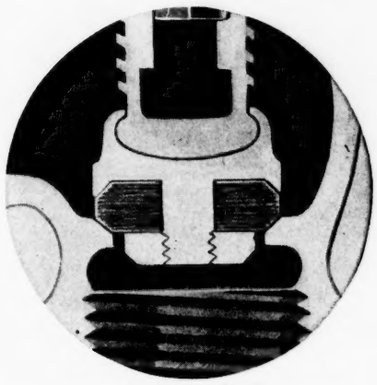

Positive Seal

We call particular attention to the following five points of advantage of this construction over the old style flat disc and seat:

FIRST—Through design of disc, and protection afforded from disc nut covering under surface, they will not warp and crack as will a flat disc which overhangs valve seat.

SECOND—The compression is at right angles to face of seat, forcing disc compound inward to center, making disc more compact and harder instead of scoring and extruding over seat, opening cracks or seams if any, as with a flat disc.

THIRD—While the life of these cone discs because of construction, as proven by test, is three to five times the life of a flat disc, and a CRACKED DISC IS IMPOSSIBLE, the matter of exchange if desired is very simple, as to remove disc nut the disc will drop from dischold er, while with a flat disc it must be dug out, often destroying dischold er. Cost the same as for a flat disc.

FOURTH—The beveled seat is low in valve body, giving perfect drainage and will wash free from sand or scale in system, positively providing against leakage through scale or grit imbedding in disc AS IS COMMON with a raised flat seat and flat disc construction.

FIFTH—Through this low beveled seat, to return condensation through valve for a one-pipe system, the flow will hold to the outer wall, leaving center of valve throat and pipe free rather than shoot out over a raised seat to the center of pipe as is common with a heavy flow over a flat seat, clogging flow of steam, causing hammer or pounding of system.

The above are all, each and every one, practical points which will prove out in test and practice.

WE SPECIALIZE on high grade radiator valves, THEREFORE QUALITY; and manufacture and furnish the largest line of any company in the world, THEREFORE QUANTITY AT MINIMUM COST, and QUALITY and COST—talk.

Get Our Catalog and Prices

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DUNKIRK **NEW YORK**

General Sale Distributors

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1709 Sansom St., Philadelphia

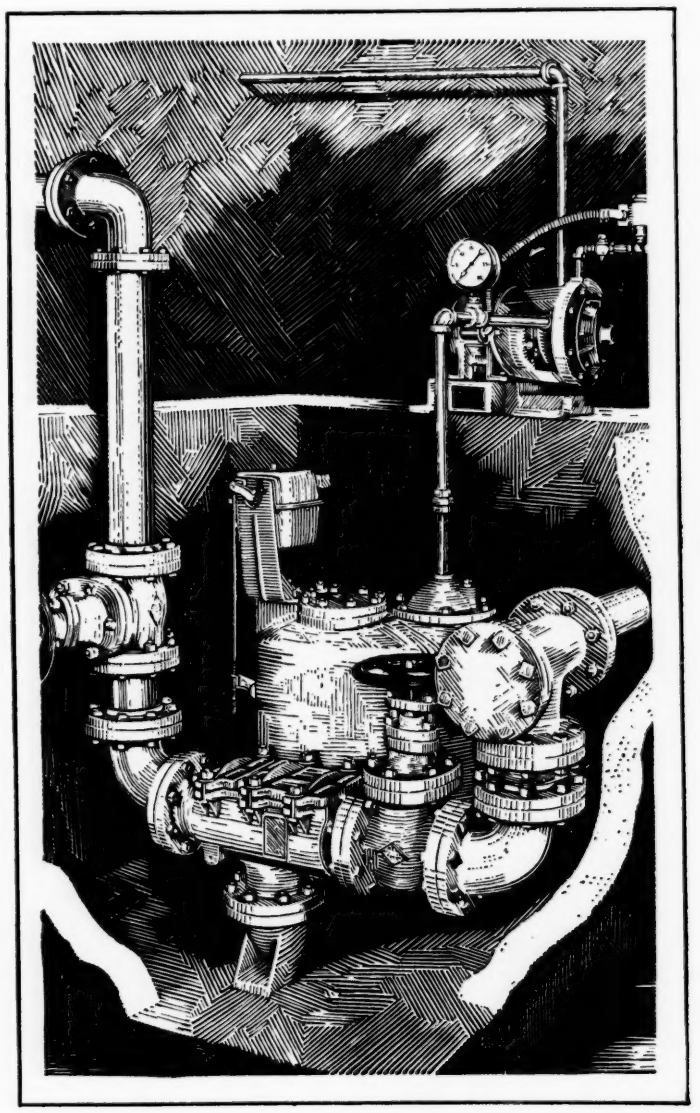
Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs
431 So. Dearborn St., Chicago, Ill.

UNITED STATES RADIATOR CORP'N
General Offices: Detroit, Mich.

SARCO COMPANY, Inc.
183 Madison Ave., New York

Taylor-Forbes Company
Canadian Agents Guelph, Ont.



Handles sewage *up to 30 g.p.m.*

FOR raising unscreened sewage from basements below street sewer level...handling waste from toilets, laundries or dishwashing machines...wherever the quantity runs no greater than 30 g. p. m., this small Jennings Ejector can be used to advantage.

Following the same simplified design as the larger Jennings units, it operates on the pneumatic principle without employing air valves, air storage tanks, or reciprocating compressors. It cannot clog because no vital moving parts come in contact with the sewage. Anything that will pass thru the extra large inlet, 4 inches in diameter, is readily handled. Screens are avoided.

The Nash Hytor Compressor furnishes air only when sewage is being moved. A smaller motor, with less h. p., is required than is needed for a centrifugal sewage pump of the same capacity. Power consumption is small.

\+ \+ \+

The Jennings Ejector shown above has a capacity of 30 g.p.m., sufficient to serve five toilets. Other sizes are furnished in capacities ranging from 50 to 1500 g.p.m. Heads up to 50 ft. Write for Bulletin 67.

Jennings Pumps

THE NASH ENGINEERING CO 81 WILSON ROAD, SOUTH NORWALK CONN.

Trade and Miscellaneous Notes

Coming Events

January 27-31, 1930. International Heating and Ventilating Exposition at Philadelphia, Pa., at the Commercial Museum.

January 27-31, 1930. Annual meeting of the American Society of Heating and Ventilating Engineers, Philadelphia, Pa. Headquarters at Benjamin Franklin Hotel.

March 31-April 5, 1930. New York's twelfth annual Home Show at the Grand Central Palace, New York.

April 7-12, 1930. Seventh annual convention of the American Oil Burner Association in Chicago, Ill. Headquarters at the Hotel Stevens.

June 3-5, 1930. Twenty-first annual convention of the National District Heating Association in St. Louis, Mo. Headquarters at Coronada Hotel.

June 16-20, 1930. Summer meeting of American Society of Heating and Ventilating Engineers, Minneapolis, Minn. Headquarters at Curtis Hotel.

International-Combustion Engineering Corporation in Receivership

The International Combustion Engineering Corp., 200 Madison Ave., New York, a $43,000,000 enterprise which has patents for distilling gas, tar, motor spirits and lubricating oil from ordinary coal, on December 19, was petitioned into equity receivership. The corporation consented to the receivership, admitting that its assets consisted largely of stock in subsidiary companies.

Bethlehem Steel Company filed the petition on the basis of being a creditor for $250,000, producing one of the most active days of trading in the market, 242,000 shares of stock having been exchanged.

Combustion Engineering Corporation and the International Combustion Tar and Chemical Corporation of Illinois were taken over by the same equity receivers. These two concerns are subsidiaries of the International Combustion Engineering Corporation. It became apparent early in October that the corporation would require additional working capital to carry on its business. Unsuccessful efforts were made to secure such financing as was needed. This situation, in the opinion of the board, made it necessary for the protection of the interest of creditors and stock holders, that the corporation and its subsidiaries be placed in the hands of receivers through the medium of a friendly suit in equity.

As stated by Mr. Wood, newly elected as the company president, "It is believed that a prompt reorganization can be effected, thus preserving the values of the properties and the demonstrated good will and earning power of the business."

N. Y. U. H. & V. E. S. to Hold Dinner-Dance

New York University Heating and Ventilating Engineers Society will hold its first annual dinner-dance at the Hotel Martinique, New York, January 18. The society had its origin at New York University in June, 1928, and is comprised of men who have graduated or are taking the heating and ventilating course.

Aims of the society are both technical and fraternal. At each monthly meeting a member who is chosen alphabetically, must deliver a lecture upon some phase of heating and ventilation. Lively and interesting discussions invariably follow these lectures. In this manner, the society hopes to accustom its members to public speaking.

Officers are as follows; President, William G. Kreitner; vice-president, Stanley J. Mickewicz; secretary and treasurer, John H. Walsh. Board of governors: Dr. A. A. Adler, W. R. Zuhlke and Dr. B. Goerg. The secretary is located at 10 Fairview Avenue, New York.

New President of Silent Glow

At the last regular quarterly meeting of the directors of the Silent Glow Oil Burner Corp., Hartford, Conn., R. M. Sherman was elected president of the company. Mr. Sherman, in the past, has held the positions of general manager, secretary and executive vice-president of the company, and has been responsible for its rapid growth.

Mr. Sherman, who is a graduate of the Navy Steam Engineering School which was held at the Stevens Institute of Technology, was at one time connected with the Automatic Refrigerating Company and with the Connecticut Electric Clock Company. During the war he served as an engineering officer on the U. S. S. Sierra.

Miscellaneous Notes

November building operations, as reported by the F. W. Dodge Corporation, show a decline of 12% from the October total and a 17% from the total for November of last year. The total figures for the 37 states east of the Rocky Mountains were $391,012,500. Analysis of this record shows that 29% of all construction was for residential buildings, 26% for commercial buildings, 19% for public works and utilities and 10% for industrial construction.

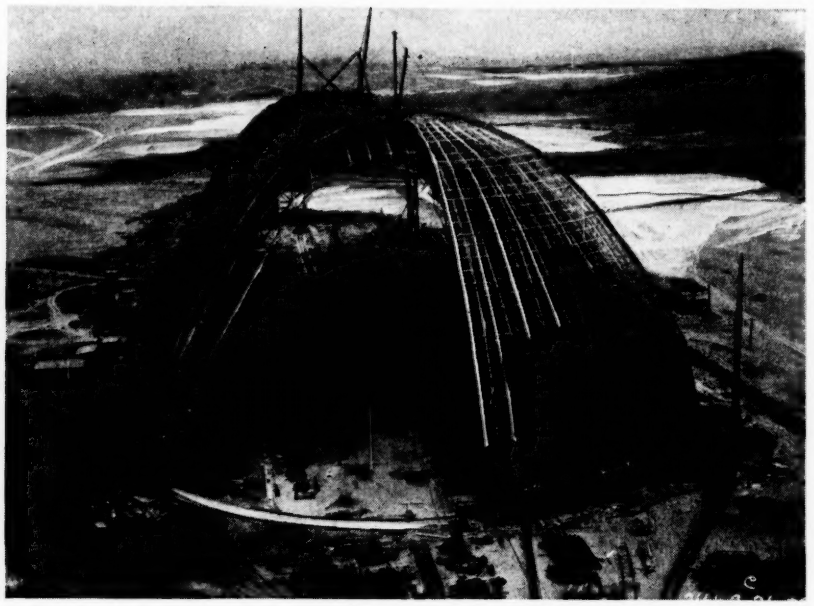
Contracts in New York State and Northern New Jersey amounted to $167,347,400, representing an increase of 65% over the total for October, and an increase of 24% when compared with the total for November of last year. In the New England States the figures amounted to $24,147,900, a decrease of 39% when compared with the October, 1929, total, and 21% from the total for November of 1928.

In the Middle Atlantic States contracts amounted to $41,363,000, a decrease of 20% below the record for October, and a 24% decrease from November of last year. Contracts in the Pittsburgh District amounted to $26,751,500, showing a decrease of 65% from the total for October, 1929, and 55% from the total for November, 1928.

Figures in the Central West amounted to $86,303,100, a 27% decrease from October of this year and a 37% decrease from the total for November of last year. In the Northwest contracts amounted to $9,967,300, representing more than twice the amount contracted for during the month of October, which is an increase of 132%, and 73% over the total for November, 1928.

Contracts in the Southeastern States amounted to $22,194,100, which was a decrease of 32% from October of this year and 25% from the total for November, 1928. Texas reports contracts amounting to $12,938,200, a decrease of 34% from the total for October of this year, and 33% from the total for November of last year.

Prof. F. E. Giesecke, director, engineering experiment station, Agricultural and Mechanical College of Texas, who has been touring Europe since September, recently visited Berlin and Switzerland, after having been in Denmark. He will go to France and England during the early part of January, and return to this country in time for the annual meeting of the A.S.H.V.E. at Philadelphia, January 27-31.



Goodyear-Zeppelin Factory, Akron, Ohio

Goodyear-Zeppelin Shops Heated with Gasteam Radiators

The great Goodyear-Zeppelin factory shops at Akron, O., the first factory for Zeppelins to be built in the United States, will be heated with Clow Gasteam radiators. Forty units will be installed in the shops and offices which will be housed in the vast hangar. Its height will equal that of a 22-story building, and will permit two super-Zeppelins to be housed at the same time.

Independent operation of each Gasteam radiator will allow heating any part of the shops and offices at any time. Shops will be built along both sides of the structure, the space provided for them being about 40 ft. wide by 640 ft. long. The ceilings in the shops will be about 35 ft. high. Eventually shops and offices will occupy all of this space, but at present they will be confined to the east side of the building.

Contract has been awarded the Goodyear-Zeppelin Corporation to build two super-Zeppelins, the ZRS-4 and ZRS-5 for the United States Navy.

Architects are Wilbur Watson and Associates; heating contractor is the Clow Gasteam Heating Company, Cleveland branch.

Manufacturers' Notes

The Berg Heating and Ventilating Co., St. Louis, Mo., announces a change in its firm name. The new company will be known as Acme Heating and Ventilating Corp., of 1308 Ann Ave., St. Louis, Mo. The management will continue the same as in the past.

Bryan Steam Corp., Peru, Ind., has placed on the market the following new sizes of boilers for oil and gas burning: No. 4, with 400 ft. steam rating; No. 16 with 3400 ft. of steam rating, and No. 22 with 6400 ft. of steam rating.

Richardson & Boynton Co., 260 Fifth Ave., New York, has established a New York branch to take care of the eastern division, with H. L. Anness as manager of this branch, and he will be assisted by A. B. Munro.

R. Wes'ey Barcus, formerly with the National Radiator Company, has been appointed manager of the Philadelphia branch at 1308 Arch Street.

Carrier Engineering Corp., Newark, N. J., announces the opening of a permanent engineering and sales office at 2706 Commerce St., Dallas, Tex. Thomas M. Cunningham is manager of the new office. William Moler will be associated with Mr. Cunningham.

Time-O-Stat Controls Co., Elkhart, Ind., announces the opening of a branch office in Boston, where they will carry a stock of the company's instruments.

George W. Akers Co., 2847 Grand River Ave., Detroit, Mich., announces the appointment of W. H. Kuhn to handle the industrial sales for the company.

Staten Island Home Utilities Co., Inc., Port Richmond, Staten Island, N. Y., held its sales and service meeting recently, when Frank I. Davis, eastern representative, and Phillip E. Folse, of the Automatic Burner Corporation, gave talks on the A.B.C. automatic oil burner. Mr. Davis presented a wrist watch to Floyd I. Silk from the firm and employees of the Staten Island company, for his work in connection with organizing and managing the company.

Tiltz Engineering Co., Los Angeles, Calif., air conditioning engineers and contractors, announces the addition of Robert N. Ward to its staff. Mr. Ward will maintain offices at 480 Lexington Ave., New York, with C. A. Anderson, formerly of the Los Angeles office.

Consolidated Gas Co. of New York, 130 East 15th St., New York, has appointed F. T. Head as manager of its House Heating and Water Heating Division. Mr. Head formerly was sales manager and is succeeded in that position by Andrew Bergmann.

L. W. Wilkins and B. J. Steiner, formerly with R. T. Clarkson Co., of Memphis, Tenn., have organized a wholesale company at 320 Piomingo St., Memphis, to be known as the Memphis Plumbing and Heating Supply Company.

American Radiator and Standard Sanitary Corp., New York, announces the establishment of a modern sales and showroom in Macon, Ga., where heating and plumbing fixtures will be displayed.

Lincoln Electric Co., Cleveland, O., announces the following promotions to district sales representatives: R. B. Tuhey, with offices at 517 Peoples Bank Bldg., Indianapolis, Ind.; S. H. Taylor, with offices at 812 Mateo St., Los Angeles, Calif.

Johnston Gas Furnace Corp., Ltd., is the new name of the Unit Furnace Co., 1001 West 25th St., Los Angeles, Calif. There will be no change in ownership or management. The product of this company has and will continue to be the Johnston gas furnaces.

Timken-Detroit Co., Detroit, Mich., announces a new selling policy of entering the field of national distribution. Since the entry of this company into the oil-burner industry four years ago, distribution has been limited to its factory branches, and while these branches will continue to operate, the expansion program now to be put in effect will place Timken burners with dealers where the company is not represented by its branches. Ten or twelve wholesale representatives will work directly under the main office and will select, appoint and supervise dealers in their respective territories.

Shaw-Perkins Mfg. Co., Oliver Bldg., Pittsburgh, Pa., announces the appointment of the Kilner-Mills Co., 3-266 General Motors Bldg., Detroit, Mich., as district representative for the sale of high convection radiators in the State of Michigan. Another announcement is that an office has been established in the Straus Bldg., 310 South Michigan Ave., Chicago, Ill., with A. H. Jolliffe, formerly secretary of the Wolff Company, in charge.

Changes of Address

Carrier-Lyle Corp., Newark, N. J. announces a change of address for the New York office from 39 Cortlandt Street to 50 East 42nd Street.

Wagner Electric Corp., St. Louis, Mo., announces the removal of its Chicago sales office and service station to 1935 Indiana Avenue.

THE PERTINENT FACTS*...

*This advertisement was suggested by a prominent Architect.

...about SPEED HEATERS

"As many useful facts as possible... all the data and no drama"...

SPEED HEATERS are suspended electric blower-type steam heaters for industrial and commercial applications. Very rapid action. May be thermostatically controlled. Extremely economical in first cost and operation.

"Facts, with the least insulation possible"...

SPEED HEATERS have two operating speeds. High speed for quick heating. Low speed for maintaining set temperature. All models equipped with high pressure Aerofin... for steam pressures up to 350 lbs. Vertical louvres spread air steam over wide area. Units are very quiet.

Sturtevant men are in principal cities ready to figure on short notice. Our "blue" catalog contains complete working data for Architects and Engineers. Copies distributed by our local offices. The coupon awaits your pencil.

THE PRICE IS 'WAY DOWN

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B. F. STURTEVANT CO.
Hyde Park, Boston, Mass.

Kindly send me a copy of the SPEED HEATER DATA BOOK.

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Street Address.....

City.....*State*.....

B. F. STURTEVANT COMPANY

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Branch Offices at: Atlanta; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C. *Canadian Offices at:* Toronto, Montreal and Galt. ◥ *Canadian Representative:* Kipp Kelly, Ltd., Winnipeg

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Sturtevant
(REG. U. S. PAT. OFF.)

SPEED HEATERS
"More Heat Less Steam"

CLACKETY-CLACK!

+ + + Printing *Wealth* + + +

WITH A WHIRR AND A CLATTER the pressroom swings into action. The floor trembles, the lights quiver, the moving maze of steel throbs in the rhythm of its own ponderous dance. A business paper is in the making. Great presses draw in at one end white paper and at the other end pour forth + wealth. For material possessions are not the only wealth of a people. Knowledge is a form of wealth + + knowledge of how to use men and materials and machines to create a wealth greater still. This knowledge + + which economists call fact-wealth, as distinct from material property + + is the wealth which begets wealth.

In the creation of fact-wealth modern business papers play a dominant part. Back of the roaring pressrooms as they pile up fact-wealth in printed form are the news staffs, gathering information at the source, and the editorial staffs, checking and correlating that information. For the business paper's knowledge must be correct + + its readers are experts; they are swift to detect error; they are prompt to appreciate fact. They follow both its reading and its advertising pages intently, for to them the business paper is a very real source of wealth.

As a creator of fact-wealth the modern business paper serves society; it serves its industry or trade; and it serves its individual readers. To this service it owes the honest circulation and the reader interest which make a good advertising medium.

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NATIONAL PIPE
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Subsidiary of United States Steel Corporation

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Advertisements under this heading, $2 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING AND VENTILATING — 521 5th Ave., New York City.

PRECISION

is a synonym for our service when we are mentioned by the Heating and Ventilating industry. The exactness of our operating methods in research has been given the stamp of national recognition by those whom we have served in the past.

All branches of Heating, Ventilating, Air Conditioning, District Heating and allied problems find ready reference in our completely equipped Laboratories.

Correspondence from manufacturers, architects and engineers is cordially invited, and assurance is given of our fullest co-operation.

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RESEARCH LABORATORY
Incorporated
1326 MARKLEY STREET
NORRISTOWN PENNSYLVANIA

Heating and Ventilating Engineer, 17 years experience design, plans, specifications, and field work, heating, ventilating, plumbing, industrial power plants, for ice cream plants, bakeries, hotels, theatres, office buildings, etc. Last three years chief mechanical engineer. Desires change. New York or vicinity. Address Box 86, Heating and Ventilating.

Specialty Salesmen wanted to handle a nationally advertised non-conflicting heating specialty as a side line, in New York and New Jersey. Leads furnished, good earnings for men who are well connected. Straight commission. Give full details in first letter. Address Box 87, Heating and Ventilating.

FOR SALE: The oldest established plumbing, heating and tinning business in North Western Colorado. Illness causing retirement. Write C. J. Kennedy, Kennedy Bldg., Craig, Colorado.

Heating and Ventilating Sales Engineers with successful sales experience in fan industry wanted. Address application to Box 88, Heating and Ventilating.

The New York Blower Company requires successful and experienced fan and unit heater salesmen. For further information address the Sales Manager, 3155 Shields Ave., Chicago, Ill.

BIG BUSINESS SAYS!

"Prepare NOW to reap YOUR share in the coming years of great business Prosperity."

HARKEN to this Command, O Ye Shop Owners, Salesmen, Mechanics, and others. Fortunes will be made in these next few years by those who KNOW. Devote this Winter to personal preparation in a technical way for going after the bigger paying jobs—the ones with the larger yearly incomes. Build big with big prosperity; our Engineering Service is at your command. Check the subject you prefer, and mail today—full information is free.

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- ☐ Special Steam and Water Heating.
- ☐ Scientific Warm Air Heating.
- ☐ Plumbing and Sanitary Engineering.
- ☐ Contracting and Estimating.
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We would like to enter your order for this New Edition. It has three new chapters and gives the very latest engineering data and manufacturers' catalogs so completely indexed you can locate any item at a glance. There are over 1000 pages 6 x 9 inches, cloth bound. Price $5.00 delivered.

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Heating and Ventilating Book Dept.,
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You may send one A. S. H. & V. E. Guide. Enclosed find $5.00.

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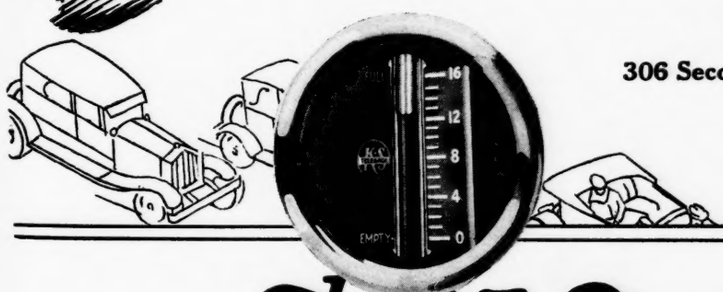

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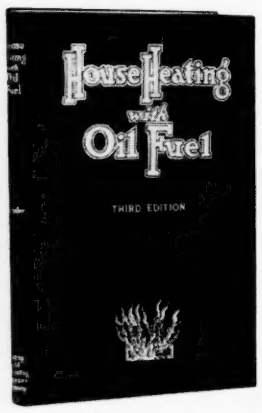

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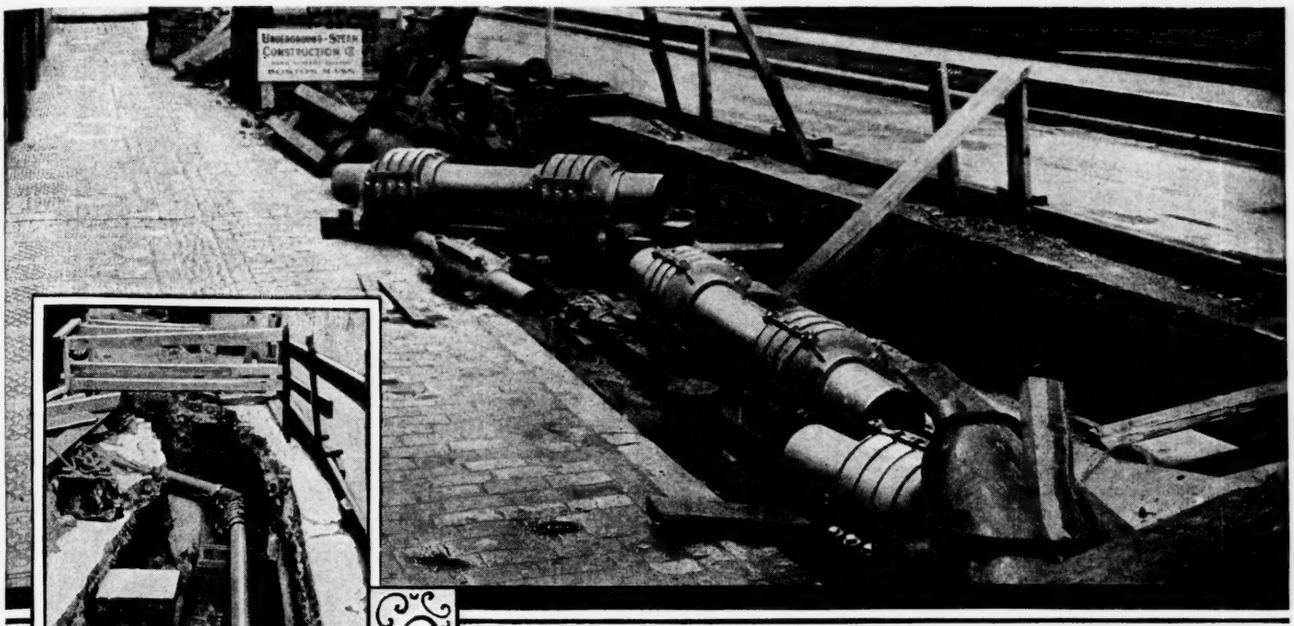

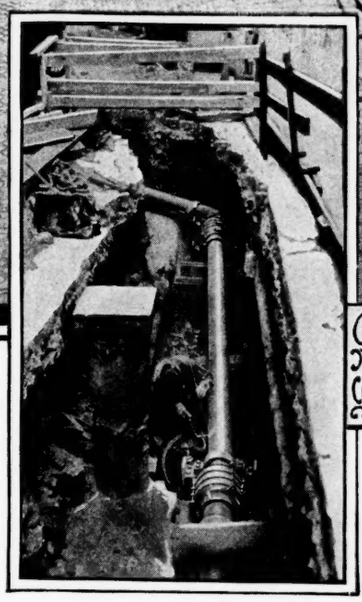

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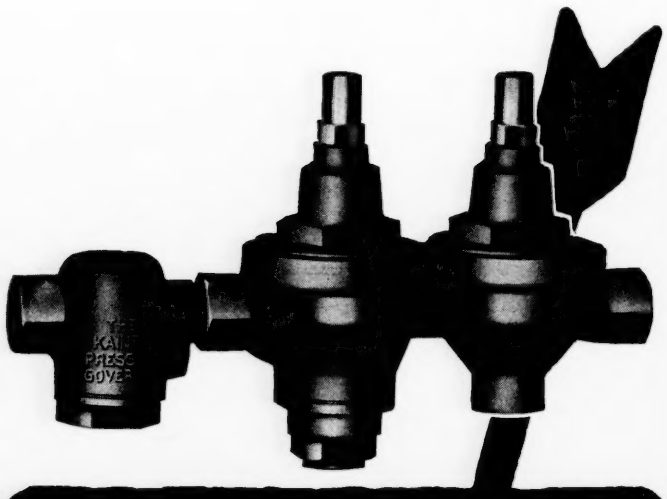

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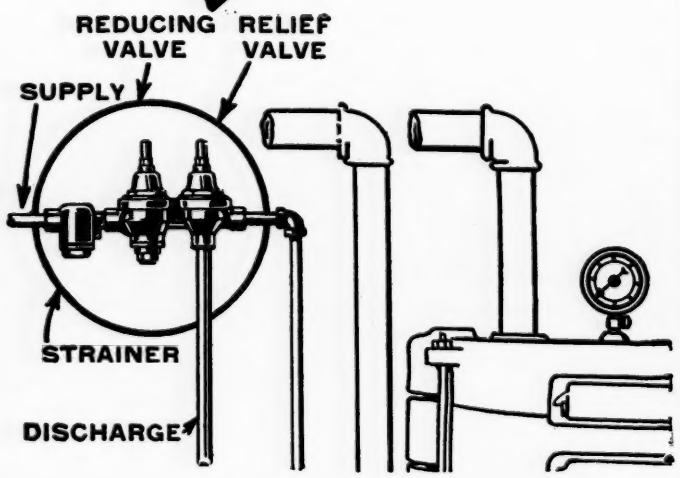

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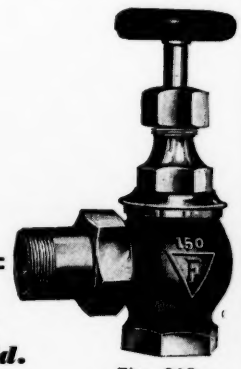

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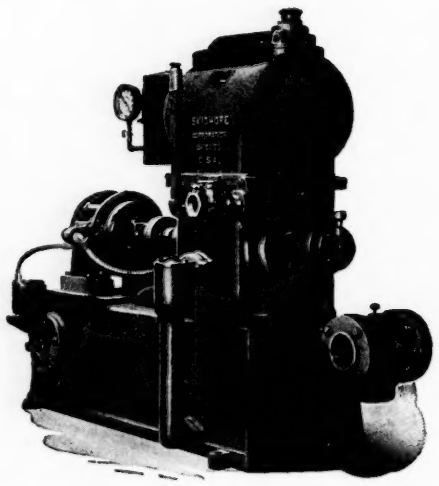

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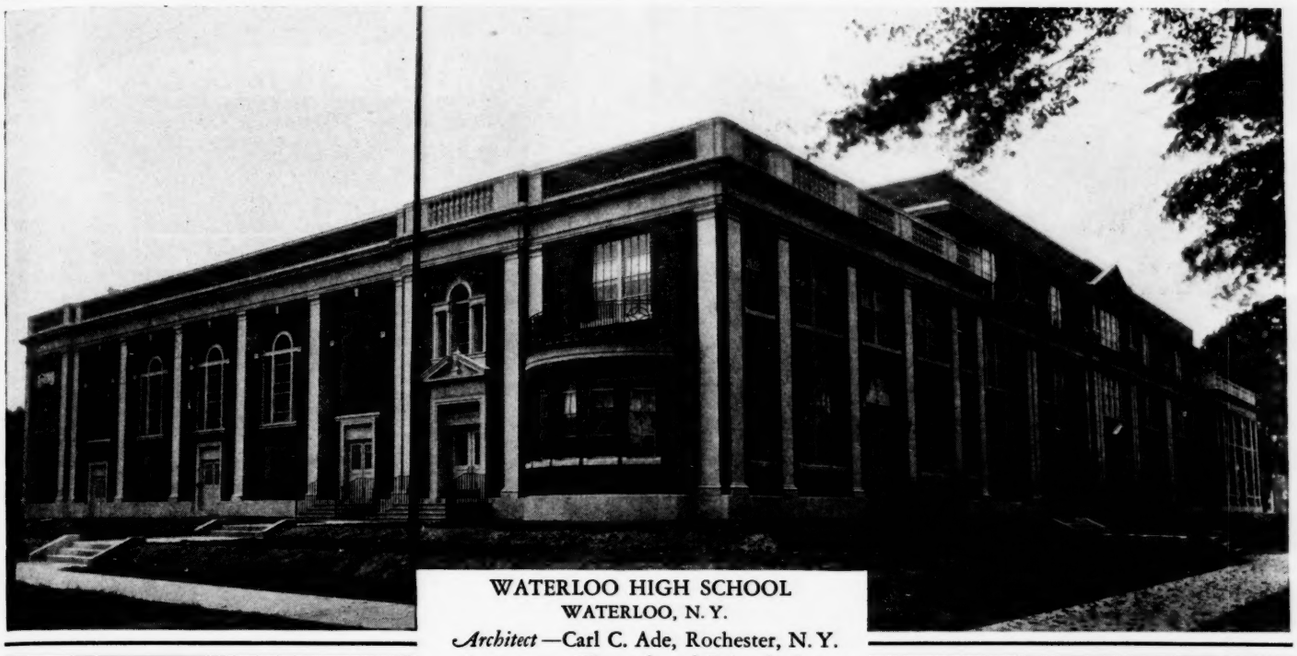

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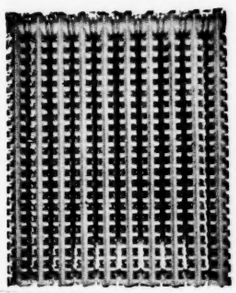

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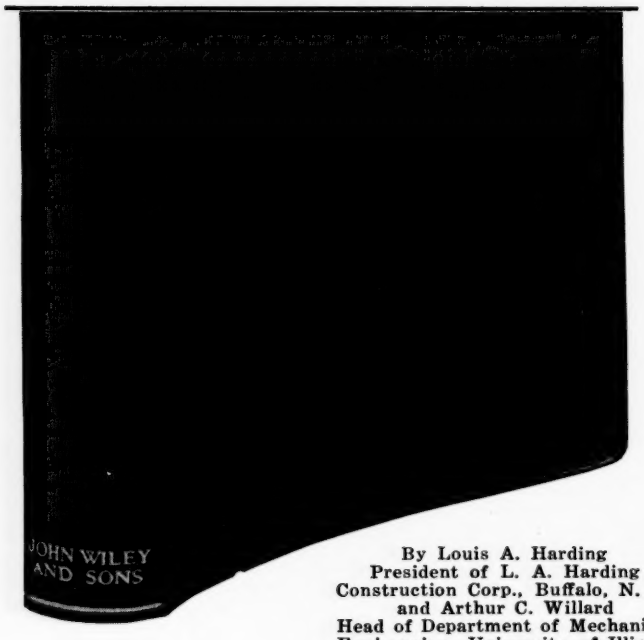

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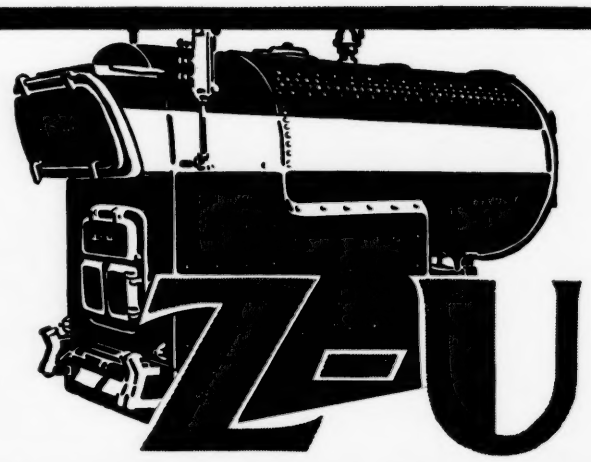

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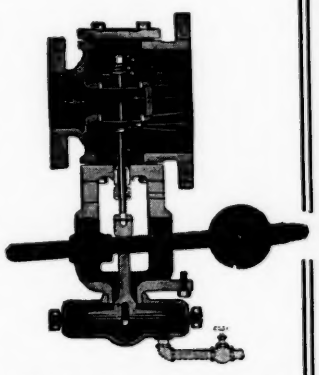

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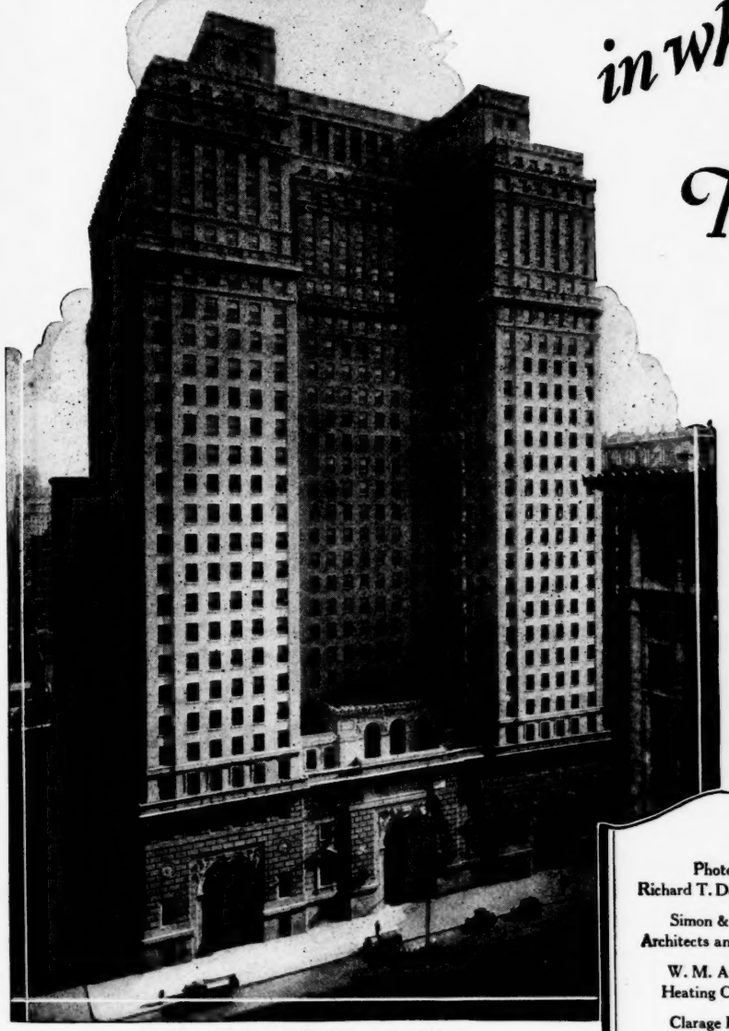

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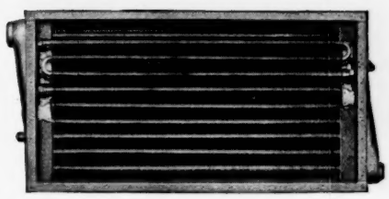

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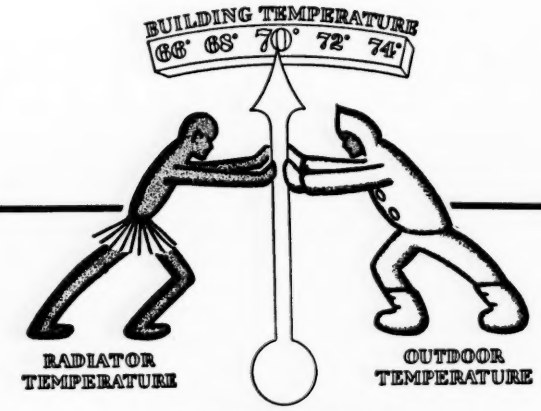


THE RAYMOND

DUO-STAT

Makes the weather regulate the heat

By controlling an automatic heating plant so that the radiator temperatures are always balanced with the outdoor temperatures the DUO-STAT regulates building temperatures effectively and economically.

Under DUO-STAT control buildings are never "overheated," nor "underheated" but are kept at the temperature you wish, regardless of the weather.

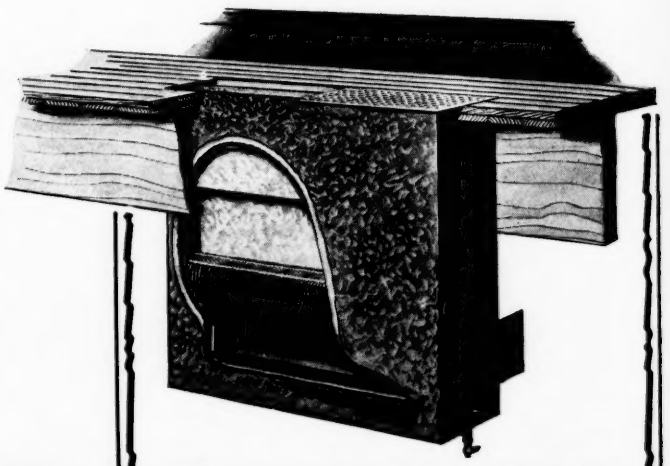
Made for

Oil Burners
Gas Burners
Coal Stokers — for

Steam, Vacuum, Vapor and Hot Water Systems
Homes—Apartments—Office Buildings

The list price of the Duo-Stat is $100 for steam and $60 for hot water. Installation costs run from $25 to $150 for steam and from $15 to $25 for hot water. Sold direct to the heating trade by ourselves or our distributors. ASK for complete data and discounts.

F. I. RAYMOND CO.
BUILDERS BUILDING
228 North La Salle Street
CHICAGO

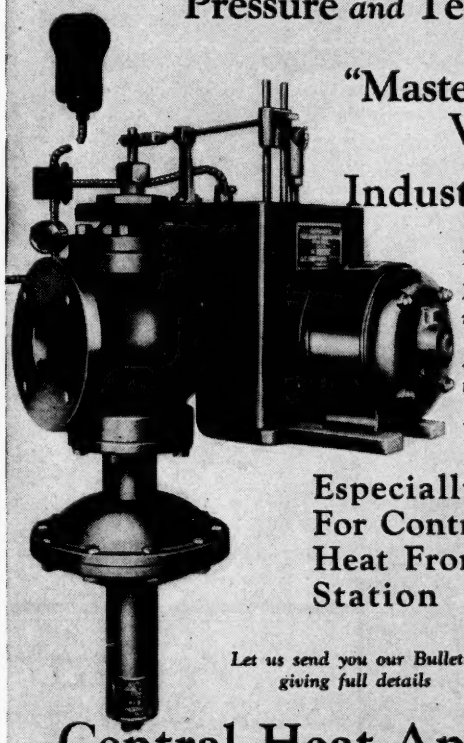


The Thermoist Unit

is the outstanding American achievement in Heating and Humidifying. It is a sturdily constructed unit which is the ultimate in simplicity of operation. Once installed it needs no further adjustment, yet a close regulation of heat in the room can be attained by means of a controlled damper. The proper amount of humidity for health and comfort is automatically supplied. Its ease of installation is a most important feature.

FRANK E. WOODWARD CO.
19 FRIEND ST. BOSTON, MASS.

HORNUNG
Pressure *and* Temperature
2 in 1
"Master Control" Valve
(PATENTED)
Industrial Type



Motor Operated Directly by Thermostat

All Relays Eliminated ... ...

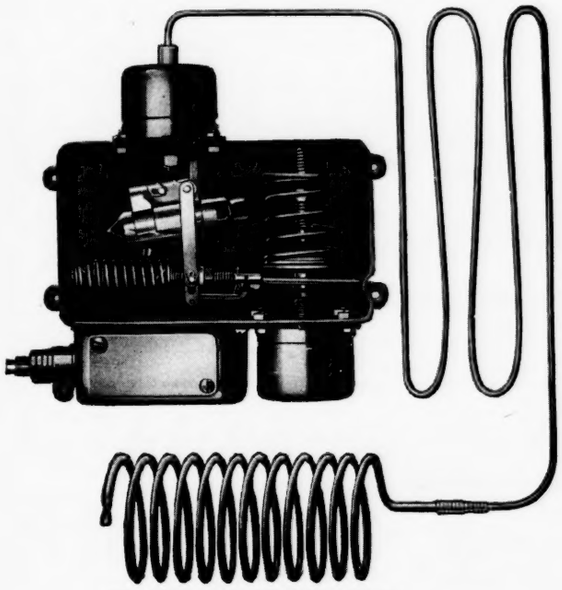
Especially Designed For Control of Steam Heat From a Central Station

Let us send you our Bulletin giving full details

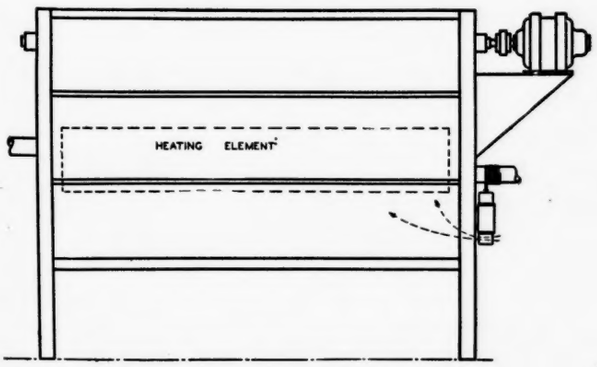
Central Heat Appliances
J. C. HORNUNG, *Engineer*
343 South Dearborn Street Chicago, Illinois
(3475)

A NEW Automatic Temperature Control for UNIT HEATERS

MERCOID *Dual Control*



Mercoid No. 848 Model DMS Dual Unit Heater Control—Cover Removed



Mercoid DMS is attached to the Heater with lower thermal element opposite a 2" hole cut in the casing. Air drawn in by the fan causes the motor to start and stop by temperature. The flexible tubing of the upper element is wound around the drip line and locks the Control in the "off" position so long as the drip line is cold.

THE new Model DMS Mercoid Dual Control provides a simple and easy means of securing automatic temperature control for Unit Heaters and greatly reduces the cost of installation over earlier methods.

This Mercoid is attached to the side of the Heater casing and combines two controls in one. One function is to start and stop the fan according to room temperature; the other to prevent the fan from operating unless there is steam in the heating surface.

One control—attached to the Heater—now accomplishes—accurately, positively—what formerly required two separate controls. This saves running conduit and wiring or breaking the piping. Especially applicable to jobs already installed. Uses the well known Mercoid switch carrying 110 or 220 volts without corrosion of contacts.

We will be glad to send you complete information if you will write us for Bulletin No. 6.

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION DEPT. M. A.-1

40 WEST 40th STREET NEW YORK CITY

THERMO SYPHON TRAPS

guarantee extended years of life for your boilers. Keeping water levels up to the safety line is essential to the proper operation of the heating system .....

Because all condensation is returned, the Thermo Syphon Trap maintains the water line regardless of pressure or vacuum, preventing air bound or water logged conditions and resultant burning or cracking of the boilers .....

Send for our Bulletin 16 H-V Giving full Details.

THERMO SYPHON TRAP

The Thermo Syphon Trap safeguards all types of vapor and atmospheric heating systems .....

We solicit your correspondence.

LYTTON MANUFACTURING CORPORATION

FRANKLIN, VIRGINIA

$1,000 Saved in eight months time!

The ROCHESTER CIRCULATOR

revolutionized the heating plant of the New York State Normal School at Geneseo, and made this tremendous saving in fuel the first winter!

Hot Water Heating with the Rochester Circulator costs less than steam or vapor,—has every good point and more,—and none of their faults.

Learn how **YOU** can benefit by this new practice. Write today for full data.

THE ROCHESTER CIRCULATOR CO.

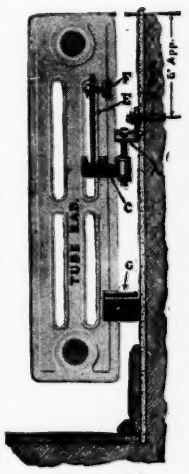
P. O. BOX 23 **ROCHESTER, N. Y.**

E-Z RADIATOR HANGER

For Wall and Tube Type Radiators

The new style "C" Hanger, together with styles "H" and "R", completes the E-Z Line. You can now guarantee your trade satisfactorily hung radiation under any and all conditions.

Style "C" Hanger is suitable for both wall and tube type radiators. No obstruction of any kind back of radiator. No need for accurate measurement of anchor bolts. Height and lateral variations taken care of. Hanger out of sight. Adapted to any wall material. In wide use and recommended by leading architects and contractors.



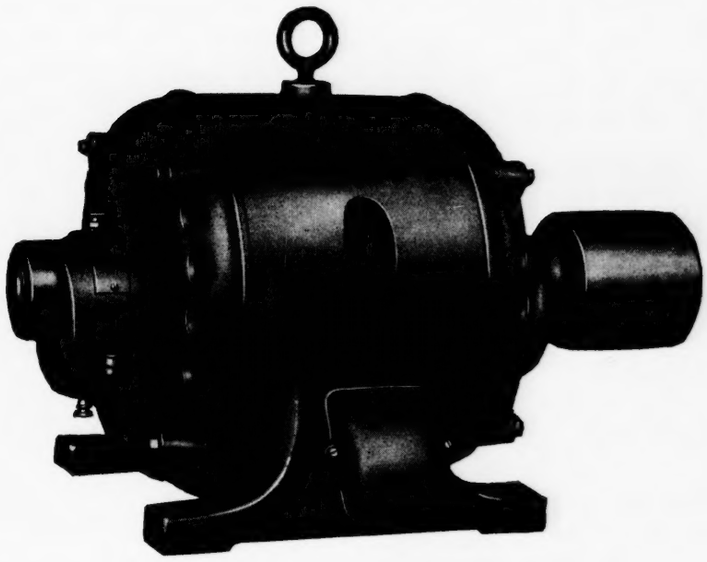
Style "C"

Write for detailed information

HEALY-RUFF COMPANY

772 Hampden Avenue **ST. PAUL, MINN.**

Also Manufacturers of E-Z Inserts



20 Horse Power Century Type SCN
Squirrel Cage Induction 3 and 2 Phase 60 Cycle Motor

Low Starting Current

Normal Torque . . . General Purpose

When a Century Type SCN Squirrel Cage Induction 3 and 2 Phase Motor is thrown directly across the line, in 30 horse power and smaller sizes, the starting current is within N. E. L. A. recommendations . . . . The starting torque of the Type SCN Motor is practically the same as that of the standard Type SC Motor.

Therefore, Century Type SCN Squirrel Cage Induction Motors are particularly suitable where a normal starting torque is satisfactory, and less starting equipment is desirable.

Century Type SCN Motors, 30 horse power and smaller sizes, are more economical to install and maintain, because they require no current-limiting starting equipment . . . . They take full advantage of the current drawn from the line, because no current is dissipated in starting equipment . . . . Line disturbances are lessened. Built in standard sizes from 7½ to 75 horse power.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.

40 U. S. and Canadian Stock Points and More Than 75 Outside Thereof

Century MOTORS

"THEY KEEP A-RUNNING"

ROME HELICALFIN TUBES

For Lower Heating Costs

Years of engineering research have provided in Rome HELICALFIN Tubes qualities which make them the ideal medium for heat transfer work. Sturdily constructed of seamless cold drawn copper tubes equipped with flat continuous copper radiating fins, they present the highest efficiency with low air resistance.

There is a size of Rome HELICALFIN Tubes for all—

Unit Heaters
Fan System Heaters
Concealed Radiation

There are no corrugations in the fin to catch and hold the dirt.

Engineering data on request.

SPECIFY ROME QUALITY

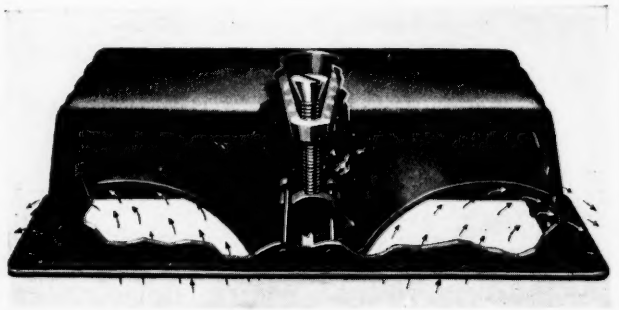
ROME-TURNEY RADIATOR COMPANY
ROME NEW YORK
The Copper City

G&O FINNED TUBING
Quality Service

WE are splendidly equipped to supply all types of finned tubing for copper radiation.

CORRESPONDENCE INVITED

THE G & O MANUFACTURING COMPANY
New Haven, Conn.
Established 1915
Manufacturers of the famous "G & O" Radiators for automotive vehicles



Pat. No. 1704661

'TIS AN ILL WIND

that blows about in theatres, assembly halls and auditoriums equipped with ventilating systems designed with improper air distribution. An installation of the

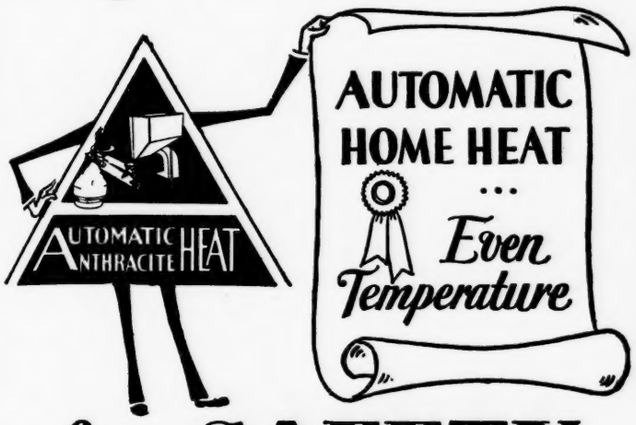
ENFLO DIFFUSER

will not only insure proper air distribution, but will present many advantages which have been recognized by architects and engineers, such as cast iron construction, operation of both dampers by one concealed screw, diffusion of air along the floor line by twin curved dampers and the economy of its installation on any type of floor.

Write for Illustrated Catalog.

VENTILATING PRODUCTS CO.
2800 Cottage Grove Ave., Chicago, Ill.

Highest Award



for SAFETY CLEANLINESS *and* ECONOMY

ON ITS RECORD in THOUSANDS OF HOMES—in all types of heating plants—new and old—steam, vapor, hot water, warm air—and under all conditions of building construction and exposure to cold—the ELECTRIC FURNACE-MAN has won the right to the HIGHEST AWARD.

Its claim of supremacy over all other AUTOMATIC SYSTEMS and FUELS is based on its superior efficiency, its outstanding SAFETY—and its incomparable merits of CLEANLINESS, LABOR-SAVING CONVENIENCE and ECONOMY.

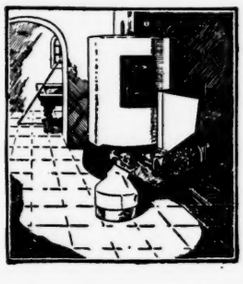
The ELECTRIC FURNACE-MAN is within the price range of every home owner. It is the one MODERN, AUTOMATIC HOME HEATING SYSTEM which meets every need, every purse, every purpose. Also ideal for hot water supply.

Burns Anthracite in the economical Buckwheat sizes. Automatically feeds coal and removes ashes, maintaining any desired temperature. Distributors and Dealers in over 300 cities. Write for interesting booklet.

The Electric Furnace-Man

(Patented Automatic Coal Burner)

Product of
DOMESTIC STOKER COMPANY,
7 Dey St.,
New York.



Endorsed by
ANTHRACITE OPERATORS' CONFERENCE

Good-Bye to RUSTY Hot Water

Now there is no need to countenance *rusty* hot water. For water comes out of the Patterson Indestructo Hot Water Heater as clean as it goes in.

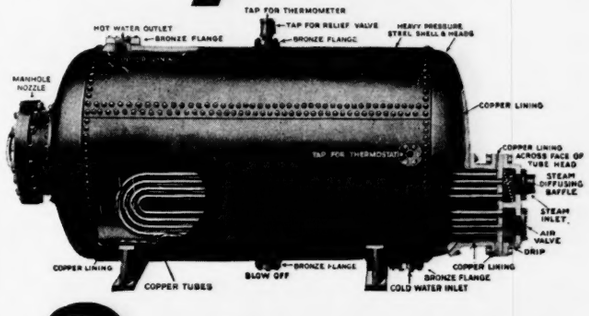
This heater consists of a steel shell completely lined with a *copper* shell and water does not come in contact with anything except copper. That gives the Patterson Indestructo two important advantages in addition to rust-free water.

First, as copper is non-corrosive, there is no rust to eat holes in the metal, therefore this heater is practically everlasting. We absolutely guarantee the Patterson Indestructo Heater to prevent discoloration of water from rust. Second, the sturdy steel shell, reinforced by the copper shell, gives added strength.

We can refer to hundreds of Patterson Indestructo Heaters throughout the country that have been in use for years.

Catalog and prices sent on request.

The Patterson-Kelley Co.
107 E. 40th St.
New York, N. Y.

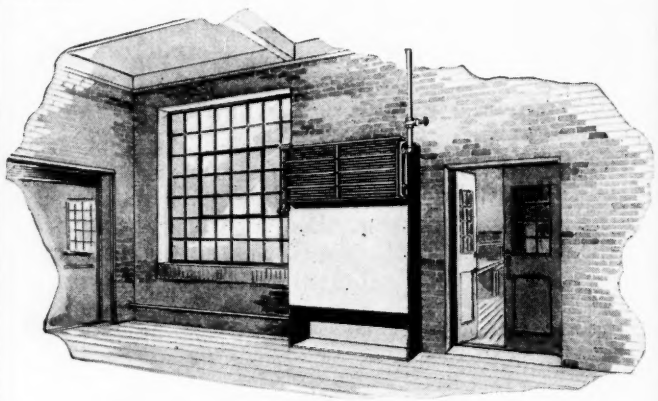


Patterson

Indestructo COPPER-LINED Hot Water Heater

TWINFAN
UNIT HEATERS FOR EVERYWHERE

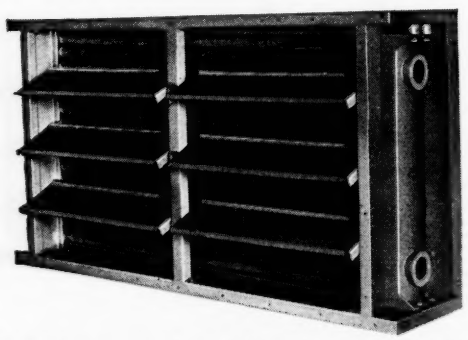
Whenever there's a real job of heating to be done—wherever unit heaters may be employed—there's a Twinfan of proper capacity for the work.



Twinfan Heater Type "D," showing floor installation. May be suspended above floor if desired.

We show here Twinfan Heater Type "D" unit, which is of simple compact design. It is shipped as a complete unit, ready for easy installation.

The fact that its two motors can be connected to separate switches for operation independently of each other, greatly increases the flexibility of control. With only one motor in operation, the capacity of the unit is approximately 60% of the full rated capacity.



This Twinfan may be either installed with floor stand or suspended above floor if desired.

One of the various types of Twinfan Heaters will economically fit into any condition — for large or small spaces of any description.

Write for fully illustrated Catalogue.

DWYER EQUIPMENT CO.
4534 W. NORTH AVE. CHICAGO, ILL.
HEAT WITH **TWINFAN** UNIT HEATERS

SUREVENT AIR VALVE

The Gorton SUREVENT Air Valve has been developed to meet the special requirements of Oil-burner Steam Heating Systems. By controlling the flow of steam to the radiators, SUREVENT Air Valves permit equalization of the system with resultant efficiency in operation and saving in fuel.

MANUFACTURED AND GUARANTEED BY
GORTON HEATING CORPORATION
ESTABLISHED 1887
96 LIBERTY STREET NEW YORK CITY

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

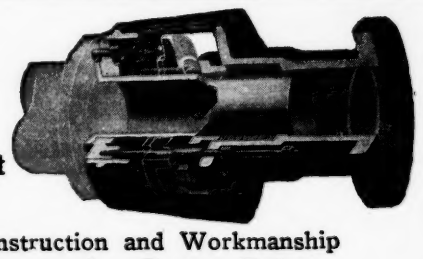
FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 350° F.
Our No. 2800 metal for temperatures below 1500° F.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
Detroit, Michigan

ROSS
Crosshead-GUIDED Expansion Joint Excels in



Design, Construction and Workmanship
Over 60% of sales—Repeat Orders
Once Used—Always Demanded
Every Purchaser—A Customer

ROSS HEATER & MFG. CO., INC., BUFFALO, N. Y.
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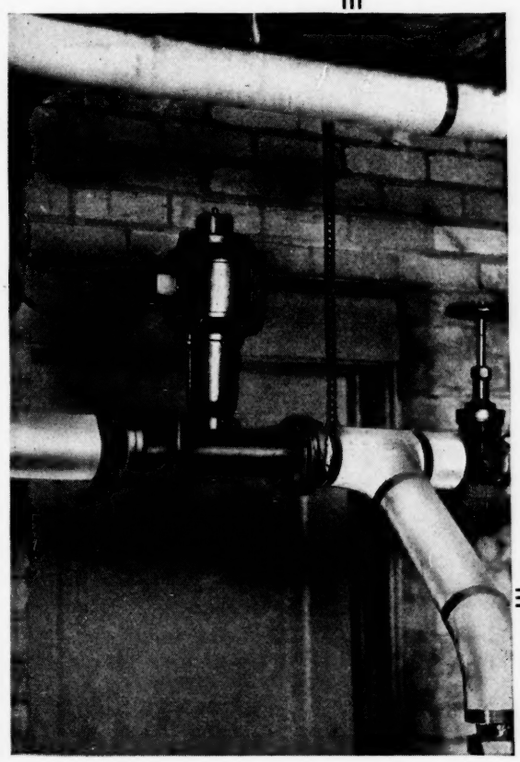
A SUCCESSFUL 1930 BALDORS NEWLY DEVELOPED MATCHED FRAMES UNIT HEATER FAN AND BLOWER MOTORS OFFER THE HEATING AND VENTILATING FIELD A COMPLETE MOTOR SERVICE OUR GREATEST CONTRIBUTION TO YOUR SUCCESS=

BALDOR ELECTRIC COMPANY

1215.

The HYDROLATOR

Marks the End of Hot Water Circulation Troubles



No longer is there any excuse for a sluggish or inefficient hot water heating or domestic supply job. The HYDROLATOR will cure all types of "sick" 2-pipe hot water systems, whatever the cause.

Every new job, too, should have a HYDROLATOR. It will assure your customers more heat on less fuel, paying for itself in fuel savings within one or two years.

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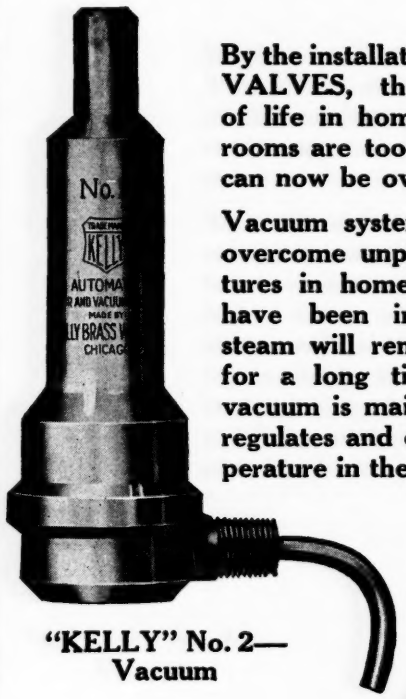
JANETTE MANUFACTURING CO.

Singer Bldg. 149 Broadway New York — 556-58 W. Monroe Street CHICAGO — Real Estate Trust Bldg. Philadelphia

A few good mid-western and southern Manufacturers' Agents' territories open.

"KELLY" VALVES
SAVE FUEL



"KELLY" No. 2—
Vacuum

By the installation of "KELLY" VALVES, the disadvantages of life in homes in which the rooms are too hot or too cold can now be overcome.

Vacuum systems have largely overcome unpleasant temperatures in homes in which they have been installed because steam will remain in radiators for a long time if a partial vacuum is maintained and this regulates and controls the temperature in the rooms.

"KELLY" No. 6—
Vacuum

The measure of our service is revealed in the fact that we have for over thirty-five years been manufacturers of Non-Adjustable Automatic Steam, Air and Vacuum Valves. The "Kelly" line is a complete line that has stood the test of time—being constantly perfected until the highest possible efficiency has been achieved.

Have your steam heating system equipped with these valves and obtain greater saving in fuel. They are guaranteed to you for a term of FIVE years.

KELLY BRASS WORKS
226-232 W. Ontario Street
CHICAGO, ILL.

HARTMANN
RADIATOR BRACKETS

THREE STYLES
AR NR NV

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CENTRAL STATION STEAM CO.
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DETROIT, MICHIGAN

MANUFACTURERS OF

Cadillac Condensation Meters
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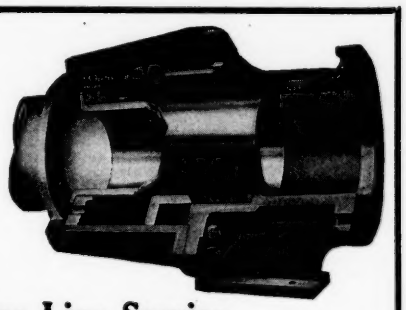
Packingless Expansion Joints and other special fittings for underground steam distribution mains.

HOWARD
Guided
Expansion
Joint



For Pipe Line Service

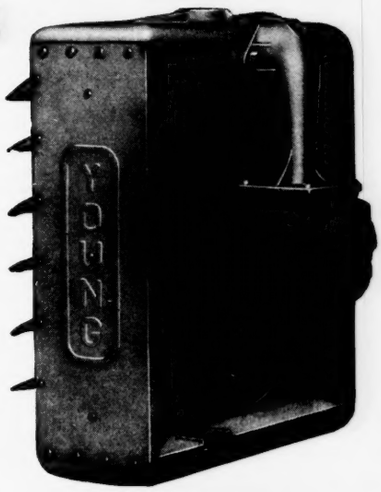
Eliminates trouble from Expansion and Contraction, saves space, labor and repair bills; the construction is mechanically correct.

ALBERGER HEATER CO. **285 Chicago St.**
HOWARD IRON WORKS **Buffalo, N. Y.**

Doing more things —and *better*

For heating the modern manufacturing plant, for rapid drying or cooling processes, for dissipating gases and vapors, Young Unit Heaters have special features that result in economy of maintenance and operation. Exceptionally sturdy construction but lighter in weight, almost vibrationless, quiet in operation, and delivering a greater volume of "useful" heated air at lower power cost, plus constructional features that make for ease of installation and maintenance, are points of real importance. It's all fully detailed in our current bulletin. Send for it.

See our exhibit, Booth 862 International Heating and Ventilating Exposition, Commercial Museum, Philadelphia, Jan. 27-31 inc.



YOUNG RADIATOR COMPANY
Heating Division
RACINE WISCONSIN
Representatives in Principal Cities
Correspondence Invited on Open Territories

Young Quality
Reg. U. S. Pat. Off.

Young Unit Heaters

© Y. R. Co.

The Three-Piece Assembly of the JOHNSTON STEEL HEATING BOILER

The picture shows the three-piece assembly of the Johnston Steel Heating Boiler. To facilitate entry through restricted openings the rear smoke connection may be shipped separate from the rest of the boiler. After the boiler is in the building the rear smoke connection may be easily and quickly bolted into place.

Substantial in construction, efficient in operation, simple in design and backed by 65 years of boiler building experience, you can depend upon the Johnston Boiler to give years of satisfactory service.

JOHNSTON BROTHERS, Inc., Ferrysburg, Mich.

Boiler Specialists for 65 Years

KENNEDY

VALVES-PIPE FITTINGS-FIRE HYDRANTS

Kennedy Standard Bronze Gate Valve for steam pressures up to 125 lb. and water pressures up to 175 lb.

THERE are many economies in standardizing on Kennedy Valves—economy in cost, for Kennedy Valves are reasonably priced; economy of time and labor, for they operate easily and with positive action; economy of power, for their wide unobstructed passages reduce friction losses to a minimum; and economy of maintenance, for they can be depended upon for many years of trouble-free service.

Send for the Kennedy Catalog

THE KENNEDY VALVE MFG. CO.

ELMIRA, NEW YORK

WAREHOUSES: New York, 128-132 White St.; Chicago, 1335-1337 So. Clinton St.; San Francisco, 448-450 Tenth St.

SALES OFFICES: New York, Philadelphia, Cleveland, Chicago, Atlanta, Salt Lake City, El Paso, San Francisco, Los Angeles, Seattle.

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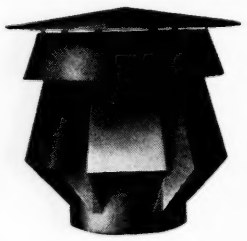
Engineers usually are. But our organization is made up of engineers and our business is done almost exclusively with them. We talk their language, study their problems and—most important of all—supply equipment and service which satisfies their most exacting requirements.

Heaters
Reclaimers
Coolers
Exchangers
Condensers

OEF BUFFALO Olive E. Frank

O. E. FRANK HEATER & ENGINEERING CO., Inc.
20 Milburn Street BUFFALO, N. Y.

Specify ÆOLUS IMPROVED VENTILATORS



Aeolus Improved Double Syphon Ventilators give 10% more power than formerly, according to Armour Institute Tests.

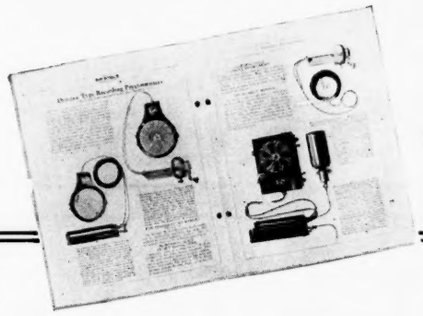
AEOLUS DICKINSON
Industrial Division of Paul Dickinson, Inc.
3340 S. Artesian Ave., Chicago, Ill.

HEATING *and* VENTILATING Classified Advertising

is especially recommended for the attention of the manufacturers in the Industry who are desirous of meeting men of proven calibre and experience in their field.

ON PAGE 132 IN THIS ISSUE

16 pages of



Catalog No. 2100

Information about BRISTOL'S RECORDING Psychrometers

WHEREVER atmospheric conditions are to be controlled, a knowledge of relative humidity is the key to securing and maintaining desired results. Bristol's Recording Psychrometers are designed to record this information automatically and continuously.

Such records can be readily filed away, and are valuable, both as a source of engineering data, and for reference in settling disputes.

Instrument Models described in this new Bristol's Catalog can be adapted to meet a great variety of installation requirements. They are easy to install, and are noted for simplicity of construction, accuracy and sensitivity of operation.

Catalog No. 2100 should be in your reference file. A copy will be sent on request to any interested person.

To aid in planning installation details, Bristol's Engineering Service is at your disposal—without obligation.

The BRISTOL Company
Waterbury, Conn.

Even when fires are banked .... *hot water!*

HOT water by the indirect method, in which the Paracoil Water Heater is installed *below the water line* of the boiler, means complete hot water service...even when fires are banked.

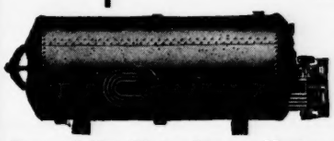
Paracoil Residence Water Heater

The boiler water is always in contact with the heating coils. If the boiler is coal fired, heating will thus continue during banked periods; if oil fired, an inexpensive attachment will maintain water at a temperature high enough for hot water service but low enough so as not to generate steam in the boiler.

The indirect method of installing Paracoil Water Heaters also saves head room and makes this method admirable for shallow cellars and low ceilings.

Paracoil U-Tube Instantaneous Water Heater

Paracoil Water Heaters are rigidly guaranteed both as to construction and service. Their dependable performance and years of usefulness have led to their being specified on many of the largest and most important building jobs.



Paracoil Hot Water Storage Heater

Write for list of prominent installations and bulletin on the type of water heater you are interested in.

DAVIS ENGINEERING CORP.
90 West St. New York

Paracoil WATER HEATERS

MANUFACTURED WEATHER

Carrier
AIR CONDITIONING
DRYING
REFRIGERATION

makes

"Every day a *good* day"
Air Conditioning

Humidification, Dehumidification
Centrifugal Refrigeration
Cooling of Public and Industrial Buildings
Temperature and Humidity Control

DRYING AND PROCESSING

Carrier Engineering Corporation

Offices and Laboratories
NEWARK, NEW JERSEY

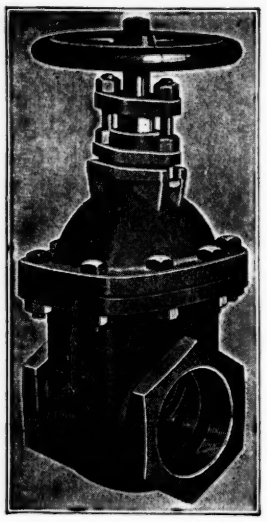
SALES OFFICES

New York, Philadelphia, Boston, Chicago, Cleveland, Detroit, Washington, Kansas City, Dallas, Los Angeles

See our detailed data in A. S. H. & V. E. Guide.

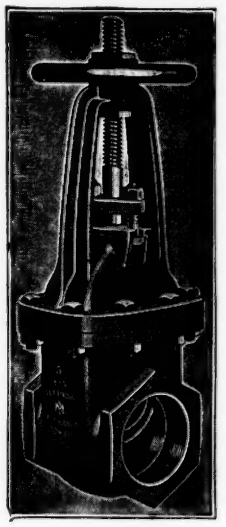
Literature on request. Write concerning your specific problem.

IRON BODY GATE VALVES



SCREWED, FLANGED
AND
HUB END STYLES

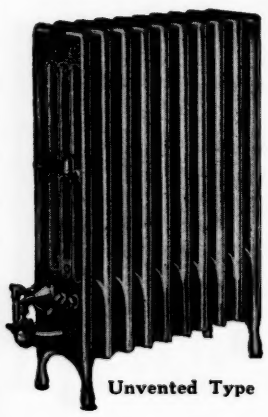
NON-RISING STEM
AND
O. S. and Y. PATTERNS



ALSO MANUFACTURERS OF
Cast and Malleable Iron Fittings
Brass Valves and Fittings

Illinois Malleable Iron Company

1801 Diversey Parkway :-: :-: Chicago, Ill.

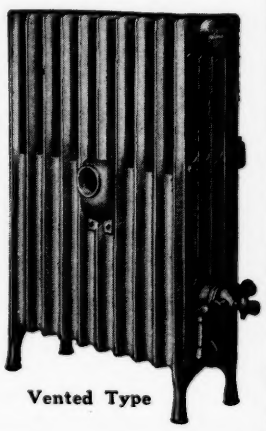


Unvented Type

PITTSBURGH AUTOMATIC GAS STEAM RADIATORS

offer automatically controlled, convenient, comfortable steam heating. No boiler, no dirt, no labor,—heat when and where you want it,—by simply striking a match. The flue type also ventilates by taking air from the floor through the radiator into the chimney or flue outlet, effecting a simple form of forced ventilation.

AUTOMATIC GAS STEAM RADIATOR CO.
301 BRUSHTON AVENUE, PITTSBURGH, PENNSYLVANIA



Vented Type

And the Steam Lines can be there when the Building is done

Ric-wiL Type F with Dry-paC Waterproof Insulation packed around pipes. Fully closed construction.

WINTER weather does not stop the installation of Ric-wiL Conduit. If the trenches can be dug, the rest of the job follows through easily.

By the time the new building is enclosed, the steam can be ready to turn on, the pipes safe underground in Ric-wiL Conduit. And the same efficiency results as in summer installations.

There's no concrete work to be held up by zero weather; only the joints require cementing. And with Dry-paC waterproof insulation there is no danger from moisture.

This is only one of the many advantages of Ric-wiL—the conduit that pays its users a bonus each winter through extra savings due to unusual efficiency.

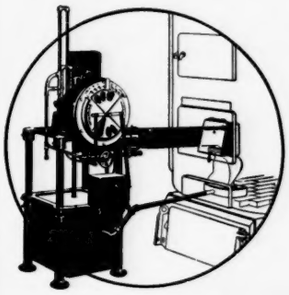
Our annual District Heating Rates Bulletin is nearly ready for issue. May we send you a copy?

The Ric-wiL Company
1567 Union Trust Bldg., Cleveland, O.
New York, Boston, Baltimore, Atlanta, Chicago

RIC-WIL
UNDERGROUND CONDUIT

McILVAINE OIL BURNER

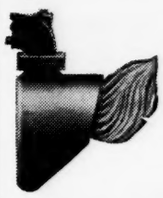
Listed as "Standard" by Underwriters



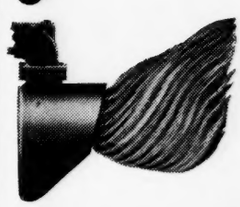
No Gas Pilot
No Electric Ignition
More Economical
More Dependable

Graduated Flame Automatically Governed

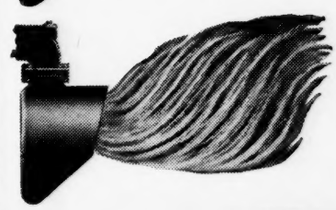
Low Flame
Acts as a Pilot Light



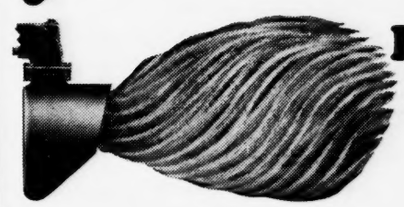
Small Flame
For Mild Weather



Medium Flame
For Cold Days



Large Flame
For Severe Cold



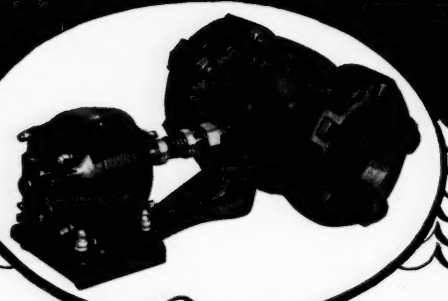
High Flame
For Extreme Cold

See our Exhibit, January 27-31, International Heating & Ventilating Exposition, Philadelphia

Write for descriptive literature and complete information. Find out if your territory is still open

McILVAINE BURNER CORPORATION
745 Custer Avenue Dept. H Evanston, Illinois

The Compeller
FOR HOT WATER HEATING SYSTEMS



for
sluggish
hot water
heating systems

WHEN rooms won't heat as they should — when any amount of *firing* seems to make no difference in *heat,* it's usually *poor circulation.*

In old hot water systems where scale has reduced effective pipe sizes—or where an enlarged house must be heated from an existing hot water system — use the compeller for positive circulation.

It will *get action.* Rapid circulation means rapid heat transfer—and that means quicker heating, more effective control and noticeable economies in fuel.

In new systems, contractors are finding that pipe sizes may be safely reduced when the Compeller is used —and that's another economy.

The Compeller is simple and dependable. It is easy to install and certain in results. Write for full particulars.

STERLING ENGINEERING COMPANY
1644 HOLTON STREET MILWAUKEE, WIS.

YOU CANNOT BUY BETTER QUALITY

With full realization of just what this statement means, we repeat that better quality heating appliances are *not* manufactured than those which make up the Barnes & Jones Vapor and Vacuum Heating Systems. Furthermore, we do not believe that better quality appliances *can* be manufactured.

Barnes & Jones
Vapor and Vacuum Heating Systems of Proven Quality

128 Brookside Ave.,
Jamaica Plain, Boston

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The Sign B&J of Quality

SEAMLESS TUBING
LENGTHS AND COILS

"Extra Heavy" Tube for Oil Burner Installations. Special Tubing to order. Parts fabricated to specifications.

Send for Data and Prices

WOLVERINE TUBE CO.
SEAMLESS COPPER BRASS & ALUMINUM
1415 Central Ave. Detroit, Mich.

Clip out this ad.

Pin it to your letterhead and mail to us. We will send you a copy of this Atlas Junior Catalog No. 21 which should be in the possession of every Heating and Ventilating Engineer. Mark the items below in which you are interested. You will receive whatever information you may want on any Atlas product.

☐ Temperature Regulators ☐ Float Valves
☐ Swing Joint Fittings
☐ Reducing Valves ☐ Bronze Unions
☐ Damper Regulators ☐ Thermostats
☐ Pump Governors ☐ Balanced Valves

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street, Newark, N. J.

Last month we featured WHITLOCK HEATERS in the largest hotel in Montreal—

but "Hot Water by Whitlock" is just as popular in more genial climates. This magnificent club, for instance, in sunny southern California also uses

WHITLOCK SERVICE WATER HEATERS

From Canada to Florida and from the Atlantic to the Pacific, Whitlock Heaters are installed

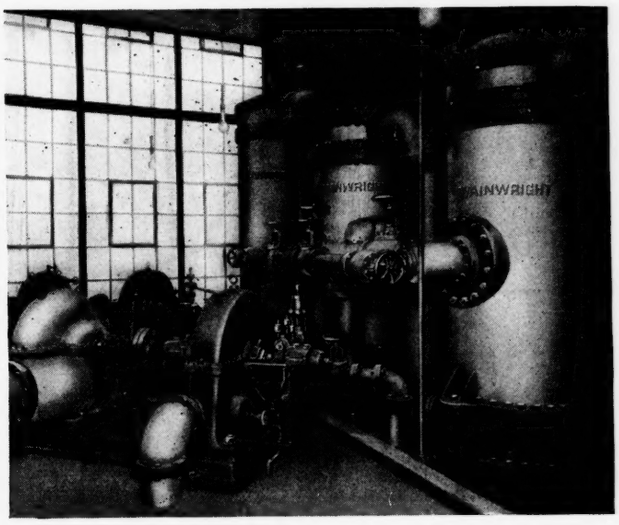
JONATHAN CLUB, LOS ANGELES
Schultze & Weaver, Architects — Ralph E. Phillips, Const. Engineer
Thomas Haverty Co., Plumbing Contractors

A phone call to our nearest office—consult your local telephone directory, or that of the nearest large city, under our name—will bring one of our Hot Water Engineers—who will gladly work with you. Or drop a line to us at Hartford for catalog and data sheets.

NEW YORK PHILADELPHIA BALTIMORE LOS ANGELES BOSTON CHICAGO DETROIT SAN FRANCISCO
and other principal cities. Consult telephone book.

THE WHITLOCK COIL PIPE COMPANY
40 SOUTH STREET, HARTFORD, CONN.

Hot Water Heating Using Exhaust Steam



Wainwright hot water heaters serving a group of buildings. The heaters are built in vertical or horizontal types. Either type may be installed, depending upon space conditions.

EACH of the Wainwright heaters here illustrated has the capacity to raise the temperature of 1600 gal. of water per minute from 170 deg. F. to 205 deg. F., when supplied with steam at 1 lb. gage pressure.

In this installation the outlet temperature of the water from the heaters is controlled at the central power plant and can be varied as desired.

Either live or exhaust steam may be used with Wainwright heaters.

FOSTER WHEELER CORPORATION
165 Broadway, New York, N. Y.
Branches in Principal Cities

Foreign Associates:—
Foster Wheeler Limited, London, England.
Societe Anonyme Foster Wheeler, Paris, France.
Foster Wheeler Limited, Toronto-Montreal-Vancouver, Canada.

FOSTER WHEELER

United States Ozone Company of America

Trade Mark

Reg. U.S. Pat. Office

Manufacturers and Engineers

ESTABLISHED 1910

U. S. VENTILATING OZONIZERS

U. S. WATER OZONIZERS

U. S. INDUSTRIAL OZONIZERS

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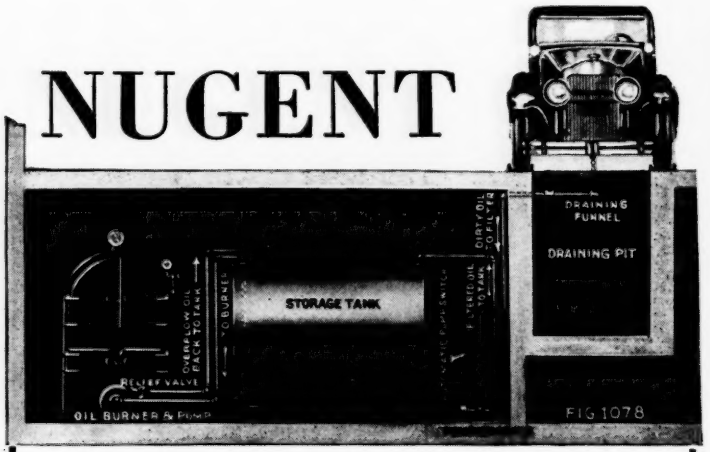
Ask for copy of

Bulletin 41—Ozone and Its Production. Bulletin 54—The Functions of Ozone in Ventilation.
Bulletin 55—The Function of Ozone in Water Purification.

Factory and Sales Office: SCOTTDALE, PENNA.

NUGENT



Seventy Thousand Garages

are doing an active business in this country, —nearly one third of that number handle sufficient crank-case oil to utilize for heating fuel.

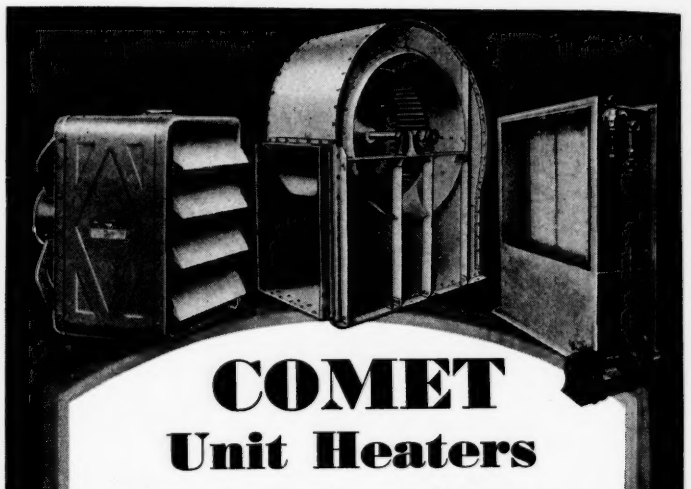
Heat Without Cost

The Nugent Crank Case Fuel Oil Filter operates automatically in accordance with the demands of the burner. The waste crank-case oil is prepared and utilized at practically no cost. There is an excellent opportunity for dealers to sell this filtering equipment as well as oil burners to garages.

Write Today For Details

Wm. W. Nugent and Company

409 North Hermitage Ave., CHICAGO, ILL.



COMET

Unit Heaters

When the heating equipment you propose to use on your job has a record of thousands of successful installations behind it, you can rely upon it to be just as successful on yours. ¶ New York Blower Products have certified ratings and a durability record that is beyond question.

For descriptive literature write to
3151 Shields Avenue, Chicago.

The NEW YORK BLOWER COMPANY

A $100.00 Course for $12.50

If you ordered the thirty lessons of Daniel's Intensified Training Course in Gravity Steam and Water Heating

with the assigned work sheets and paper, you would pay $100.00 or more. We offer our readers the complete course of instruction in two ring binders, but without the consultation privilege, for the small sum of $12.50.

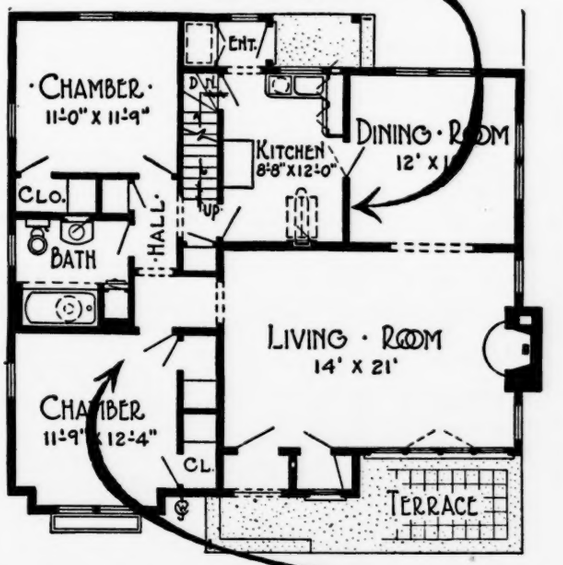
The thirty lessons are divided into six parts as follows: Part 1. Fundamentals of Heating, five lessons; Part H. Hot Water Heating Systems, Gravity, Accelerated, seven lessons; Part R. Radiators and Radiation, three lessons; Part S. Steam Heating Systems, eight lessons; Part B. Hot Water and Steam Boilers, four lessons; Part HSE. Estimating Costs, three lessons.

Each lesson is a bound pamphlet 6 x 9 in. in size, containing thirty-two or more pages of concise and practical instruction.

Name.....

Address.....*City*.....

A Single Thermostat HERE



will *not* give *comfortable temperature* HERE

NO house can be regulated for constant temperature in *all* rooms with a single thermostat.

The amount and kind of radiation, the direction and velocity of the wind, the exposure of the rooms make a single control obviously ineffective.

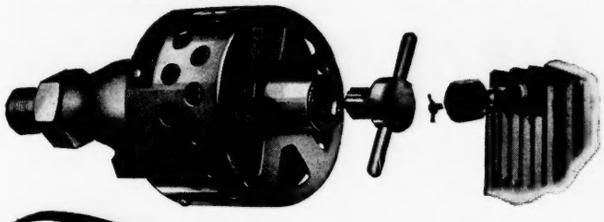
Or if sleeping and recreation rooms are to be kept cooler than others, a single control gives no assurance of maintaining the desired temperature.

The solution is individual room temperature control — the Thermotrol. It replaces the radiator valve on steam, vapor or hot water systems. It effectively maintains the temperature which each room requires — and it requires no attention.

Thermotrol has solved the temperature control problem at a cost that has put really *convenient heat* within reach of almost any pocket book.

Write for complete information.

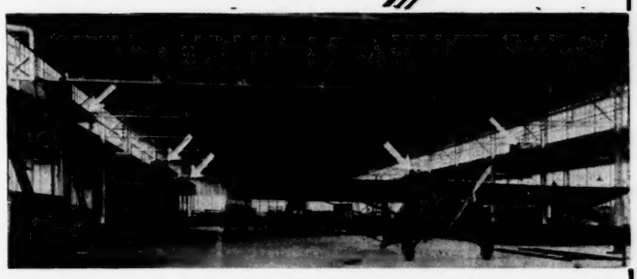
STERLING ENGINEERING COMPANY
1644 Holton Street Milwaukee, Wis.



The Thermotrol

$ .0023

Per Cubic Foot Per Season —



Interior of the Metal-Aircraft Corp. Bldg., Cincinnati, O., heated by "SUNNYAIRE" gas-fired unit heaters, using 385 cu. ft. of 900 B.t.u. mixed gas per hour and having a total heat delivery of approximately 2,100,000 B.t.u. Offices heated by "Sunnyaire" Heat Cabinets.

One Hundred Percent Automatic Control with

SUNNYAIRE

(Formerly "STERLING")

Direct Gas-Fired UNIT HEATER

again shows greater efficiency, lower operating costs and less maintenance expenses in heating

600,000 cubic feet

in the all-steel constructed, seventy percent glass exposure plant of the

METAL AIRCRAFTS CORPORATION
CINCINNATI, OHIO

Uniform ideal working temperatures maintained despite a 2,100,000 B.T.U. heat loss, and without the loss of floor space.

INVESTIGATE!

WRITE! WIRE! PHONE!

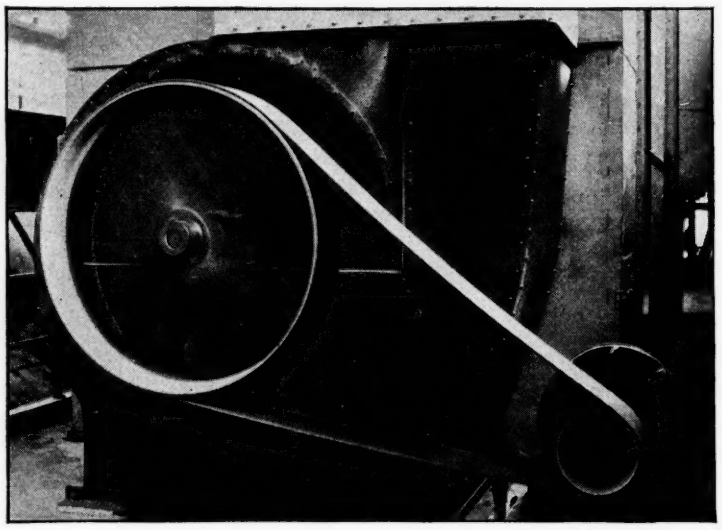
TEXO Heater and Manufacturing CORP.

Originators of the Gas-Fired Unit Heater

COVINGTON, KY.

See our Exhibit at the International Heating & Ventilating Exposition Philadelphia, Jan. 27-31, 1930

TENTACULAR



for the transmission of power from Motors to Fans is more SIMPLE, more EFFICIENT, much CHEAPER in cost and operation than any other type of drive.

Do not fail to visit our Exhibit at the International Heating and Ventilating Exposition, Philadelphia, January 27th to 31st, inclusive, 1930.

Alexander Brothers, Inc.

General Office and Plant: 15 South St., Philadelphia, Pa.

Branches
CHARLOTTE, N. C.
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Distributors in all Principal Cities

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"Sole Makers of Tentacular Transmission Belt"

NATIONAL Control

includes thermostats for single or two-temperature control on direct radiation, air conditioning, blast or unit heating systems; humidity controls; firing and damper control for high pressure boilers; damper regulators for low pressure and hot water domestic heating boilers; and temperature control for hot water supply systems.

Write for descriptive literature covering your control requirements

National Regulator Co., 2309 Knox Ave., Chicago, Ill.

WATTS DIAPHRAGM RELIEF VALVE TYPE 28

Especially designed to relieve excessive pressure on domestic range boilers and storage tanks. Bronze body and diaphragm—genuine Jenkins disc. Valve cannot clog or foul.

Approved by Underwriters' Laboratories.

WATTS REGULATOR CO.
LAWRENCE, MASSACHUSETTS
Sales Associates
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S&K RADIAFIN TUBES

will be on display at the Heating and Ventilating Exposition

½" to 6". High or low pressures.

Send for data sheet.

SCHUTTE KOERTING

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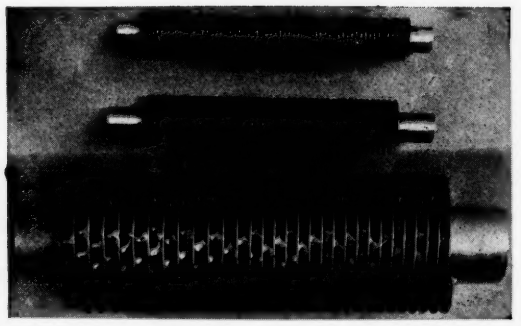
PHILADELPHIA, PA.



Protect Your Boiler
with a
Valve in the Head
Simplex Boiler Return Trap

No steam heating system is more reliable than the equipment which returns the condensation to the boiler.

UTMOST DEPENDABILITY

is built into this trap from general design to the last detail of construction.

PLAIN AS THE NOSE ON YOUR FACE

the valves stand out for quick and easy inspection.

All working parts of solid bronze. Copper jacketed asbestos gaskets used in every joint.

Made for Lifetime Service

Please write for details.

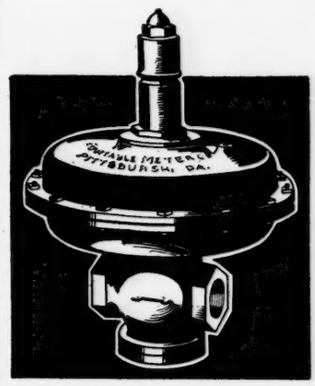
Simplex Heating Specialty Co.
Incorporated
LYNCHBURG VIRGINIA

THE GAS FIRED ERA IS IN VOGUE

BOILERS
FURNACES
REFRIGERATORS
WATER HEATERS
INCINERATORS
CLOTHES DRYERS

Refrigerators, water heaters, clothes dryers, incinerators, furnaces, boilers — in fact, all gas fired appliances operate efficiently only when the proper pressure is at the burners.

EMCO Gas Appliance Regulators control the pressure and hold it constant at the burners.



Pittsburgh Equitable Meter Co.
Main Office & Factories—Pittsburgh, Pa

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Dallas, Texas Los Angeles, Cal. Salt Lake City, Utah

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Duriron Company, Inc., The, Dayton, O.

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Bishop & Babcock Sales Co., Cleveland, Ohio.
Janette Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Nash Engineering Co., So. Norwalk, Conn.
Powers Regulator Co., Chicago, Ill.

AIR CONDITIONING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
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Carrier Engineering Corp., Newark, N. J.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
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National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
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U. S. Ozone Corp., Scottdale, Penn.
Woodward Co., Frank E., Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

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Bayley Blower Co., Milwaukee, Wis.
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Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
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Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
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Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.

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Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
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Sarco Co., Inc., New York.
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Reed Air Filter Co., Louisville, Ky.
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Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
New York Blower Co., Chicago, Ill.

BELTING
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BLOWERS
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Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
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The Stack Heater Co., Boston, Mass.

BLOWERS, FAN
(See Fans, Supply & Exhaust).

BOILERS, HEATING, CAST-IRON, COAL BURNING
American Radiator Co., New York.
Burnham Boiler Corp., Irvington, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Newport Boiler Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Weil-McLain Co., Chicago, Ill.

BOILERS, HEATING, DOWN-DRAFT, COAL BURNING
American Radiator Co., Buffalo, N. Y.
Brownell Co., The, Dayton, Ohio.
Coatesville Boiler Works, Phila., Pa.
International Boiler Works, East Stroudsburg, Pa.
Kewanee Boiler Corp., Kewanee, Ill.
National Radiator Corp., Johnstown, Pa.
Orr & Sembower Co., Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

BOILERS, HEATING, GAS-FIRED
American Gas Products Corp., New York
American Radiator Co., Buffalo, N. Y.
International Boiler Works, E. Stroudsburg, Pa.
National Radiator Corp., Johnstown, Pa.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, MAGAZINE FEED
Gorton Heating Corporation, New York.
Newport Boiler Co., Chicago, Ill.
Orr & Sembower Co., Reading, Pa.

BOILERS, HEATING, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
International Boiler Works, E. Stroudsburg, Pa.
Johnston Bros., Inc., Ferrysburg, Mich.
Monitor Boiler Co., Philadelphia, Pa.
Orr & Sembower, Reading, Pa.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, HEATING, STEEL, COAL-FIRED
Brownell Co., The, Dayton, Ohio.
Coatesville Boiler Works, Coatesville, Pa.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corp., New York.
International Boiler Works, East Stroudsburg, Pa.
Heggie-Simplex Boiler Co., Joliet, Ill.
Johnston Bros., Inc., Ferrysburg, Mich.
Kewanee Boiler Corp., Kewanee, Ill.
Monitor Boiler Co., Philadelphia, Pa.
Oil City Boiler Wks., Oil City, Pa.
Orr & Sembower, Reading, Pa.
Pacific Steel Boilers Corp., Waukegan, Ill.
Stanwood Corporation, Cincinnati, O.
Triple Duty Boiler Co., Detroit, Mich.

BOILERS, POWER
Coatesville Boiler Works, Phila., Pa.
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Orr & Sembower, Reading, Pa.
Stanwood Corporation, Cincinnati, O.
Titusville Iron Wks. Co., Titusville, Pa.

CIRCULATORS, WATER
Janette Mfg. Co., Chicago, Ill.
Rochester Circulator Co., Rochester, N. Y.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONDUITS, UNDERGROUND PIPE
American District Steam Co., North Tonawanda, N. Y.
Ric-wiL Co., The, Cleveland, Ohio.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Foster Wheeler Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Ric-wiL Co., The, Cleveland, Ohio.

DAMPER REGULATORS
(See Regulators, Damper).

DAMPERS, DUCT
National Regulator Co., Chicago, Ill.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.

DISTILLERS (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRAFT APPLIANCES, MECHANICAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
National Regulator Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

ENGINES, STEAM
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, O.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson, Chicago, Ill.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Skinner Bros. Mfg. Co., St. Louis, Mo.
St. Louis Blow Pipe & Heater Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

EXHAUST SYSTEMS, ACID
Duriron Co., Inc., The, Dayton, O.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Crane Co., Chicago, Ill.
Foster Wheeler Corp., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

FANS, CENTRIFUGAL
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FANS, DISC
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

PRESSURE
De Bothezat Impeller Co., New York.

FANS, PROPELLER
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Emerson Electric Mfg. Co., St. Louis, Mo.
Hartzell Propeller Co., Piqua, Ohio.
Modine Mfg. Co., Racine, Wis.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

FANS, MULTI-BLADE
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

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Bayley Blower Co., Milwaukee, Wis.
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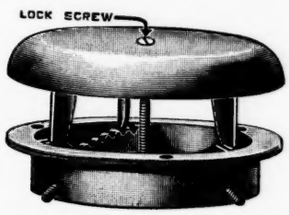

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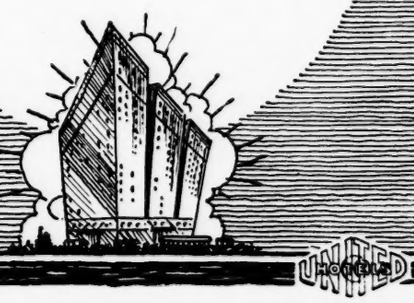

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Watts Regulator Co., Lawrence, Mass.

FILTERS, CRANKCASE, OIL

Nugent & Co., W. W., Chicago, Ill.

FILTERS, (AERATING)

Davis Engineering Corp., New York.

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Davis Engineering Corp., New York.

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Crane Co., Chicago, Ill.
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Nugent & Co., W. W., Chicago, Ill.

FITTINGS, PIPE, FLANGED

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Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FITTINGS, PIPE, SCREWED

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Walworth Co., New York.

FLANGES

Crane Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Walworth Co., New York.

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Sweet & Doyle Co., Troy, New York.

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Crane Co., Chicago, Ill.
Jenkins Bros., New York.

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Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGE BOARDS

Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES

Crane Co., Chicago, Ill.
Jenkins Bros., New York.

GAUGES, ALTITUDE

American Radiator Co., Buffalo, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.

GAUGES, COMBINATION PRESSURE AND ALTITUDE

Marsh, Jas. P., Chicago, Ill.
Foxboro Co., The, Foxboro, Mass.
Bristol Co., Waterbury, Conn.
Mercoid Corp., Chicago, Ill.

GAUGES, DRAFT

Bristol Co., The, Waterbury, Conn.
Foxboro, Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC

Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

GAUGES, OUNCE GRADUATED

Bristol. Co.. The. Waterbury. Conn.
Dunham Co., C. A., Chicago, Ill.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

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Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

GAUGES, TANK

King-Seeley Corp., Ann Arbor, Mich.

GAUGES, VACUUM

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)

Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER

Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
The Stack Heater Co., Boston, Mass.
Walworth Co., New York.

GENERATOR COOLING SYSTEMS

American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS (PUMP)

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Watts Regulator Co., Lawrence, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING

Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, ROCKING

Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING

Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Corp., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING AND DUMPING

Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Stanwood Corp., Cincinnati, Ohio.

GRATES, SHAKING, CIRCULAR

Fitzgibbons Boiler Co., Inc., New York.

GRATES, STATIONARY

Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEAT CABINETS

(See Radiators, Cabinet and Concealed)

HEATERS, AIR, FAN SYSTEM

Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Rome-Turney Radiator Co., Rome, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
Young Radiator Co., Racine, Wis.

HEATERS, DOMESTIC WATER

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
Monitor Boiler Co., Philadelphia, Pa.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
The Stack Heater Co., Boston, Mass.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT

American Blower Co., Detroit, Mich.

HEATERS, FEED WATER, (CLOSED)

Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Stanwood Corp., Cincinnati, Ohio.
The Stack Heater Co., Boston, Mass.
Watts Regulator Co., Lawrence, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER (OPEN)

Frost Mfg. Co., Galesburg, Ill.
Stanwood Corp., Cincinnati, Ohio.

HEATERS, FUEL-OIL

Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Electrol, Inc., St. Louis, Mo.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
The Stack Heater Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT

Air-Way Electric Appliance Corp., Toledo, Ohio.
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Philadelphia, Pa.
Young Radiator Co., Racine, Wis.

HEATERS, UNIT GAS FIRED

General Gas Light Co., Kalamazoo, Mich.
Texo Heater & Mfg. Co., Covington, Ky.

HEATING SYSTEMS, VACUUM

Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Wm. S. Haines & Co., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago Ill.
McAlear Mfg. Co., Chicago, Ill
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR

American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York
Wm. S. Haines & Co., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, WATER

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Mueller Co., Decatur, Ill.
Page Boiler Co., Wm., H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
The Stack Heater Co., Boston, Mass.

HUMIDIFIERS

American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Watts Regulator Co., Lawrence, Mass.
York Heating & Ventilating Corp., Philadelphia, Pa.

HUMIDITY CONTROL

Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland. Ohio.
Carrier Engineering Corp., Newark, N. J
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING

Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING

Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.

(See Covering, Boiler, Pipe, etc.)

INSULATION, BUILDING

Celotex Co., Chicago, Ill.
Flax-li-num Insulating Co., St. Paul, Minn.
Insulite Co., Minneapolis, Minn.

KETTLES, COPPER

Badger & Sons Co., E. B., Boston, Mass.

MANOMETERS

American Blower Co., Detroit, Mich
Foxboro Co., Inc., The, Foxboro, Mass.

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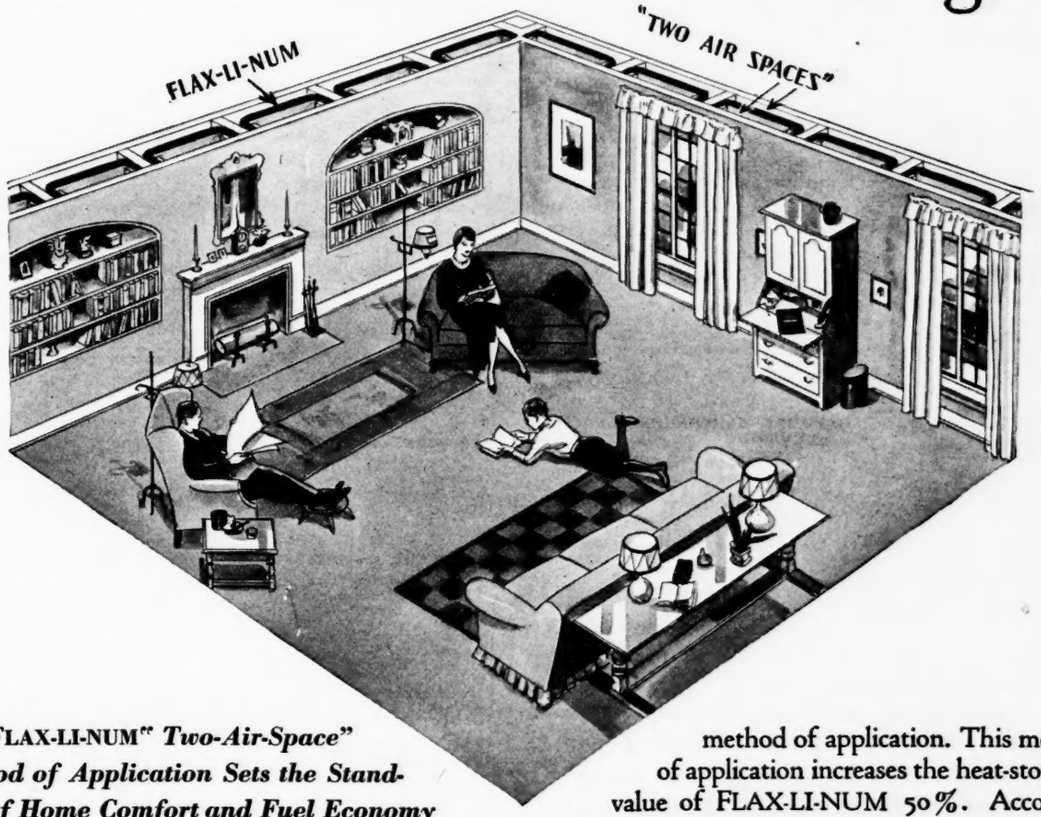

The* FLAX-LI-NUM *"Two-Air-Space" Method of Application Sets the Standard of Home Comfort and Fuel Economy

THE purpose behind FLAX-LI-NUM is to provide the greatest possible insulating value from an economical thickness of material . . . In other words, to make it possible to economically insulate a home in such a way that the owner will receive the *full benefits* of the insulating material.

Scientific research proved that this is only possible when the insulating material is designed for and used as insulating alone. To combine it with any other step in construction such as plaster base or sheathing means a loss of insulating value. Therefore, FLAX-LI-NUM is a single purpose material . . semi-rigid in form . . designed to be applied by the "two-air-space" method of application. This method of application increases the heat-stopping value of FLAX-LI-NUM 50%. According to the U. S. Bureau of Standards Letter Circular No. 227. "The addition of ½ inch layer of insulation in the middle of the air space in a frame wall is, therefore, the equivalent of adding about a ¾ inch layer at some other place in the wall". FLAX-LI-NUM is the outstanding, scientifically correct insulating material. It is made in uniform sheets of one-half inch and full one inch thickness. It is easily and quickly applied to the walls and ceilings or roof . . . and will stay in place permanently without cracking, tearing or in any way losing its original insulating value.

Full information covering recommended specifications is contained in the FLAX-LI-NUM Manual. We will be pleased to send you a copy for your files.

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ST. PAUL, MINN.

Flax-li-num
A CORRECT BUILDING INSULATION AND SOUND CONTROL MATERIAL

FLAX-LI-NUM INSULATING CO. HV-1
St. Paul, Minnesota

Send me complete information about Flax-li-num. Also facts about the "two-air-space" method.

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Address.....

City..... State.....

MECHANICAL DRAFT APPLIANCES
(See Draft Appliances, Mechanical)

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.

METERS, FEED WATER
Central Station Steam Co., Detroit, Mich.

METERS, FLOW
Foxboro Co., Inc., The, Foxboro, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
American District Steam Co., North Tonawanda, N. Y.

MOTORS (ELECTRIC)
Baldor Electric Co., St. Louis, Mo.
Century Electric Co., St. Louis, Mo.
Emerson Electric Mfg. Co., St. Louis, Mo.
Janette Mfg. Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

NOZZLES, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

NOZZLES, SPRAY
American Blower Co., Detroit, Mich.
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

OIL BURNERS
Electrol Inc., St. Louis, Mo.
Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
McIlvaine Burner Corp., Chicago, Ill.

OIL BURNER EQUIPMENT
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Hornung, J. C., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Johnston Brothers, Inc., Ferrysburg, Mich.
W. W. Nugent & Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

OIL BURNER IGNITION AND CONTROL EQUIPMENT
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Penn Electric Switch Co., Des Moines, Iowa.
Temperature Control Co., Chicago, Ill.
Time-O-Stat Controls Co., Elkhart, Ind.

OZONE APPARATUS
United States Ozone Co. of America, Scottdale, Pa.

PIPE, ACID-RESISTING
Duriron Co., Inc., The, Dayton, O.

PIPE BENDING
Badger & Sons Co., E. B., Boston, Mass.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING (WOOD)
American District Steam Co., North Tonawanda, N. Y.

PIPE, CAST-IRON
American Radiator Co., New York.

PIPE HANGERS
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Walworth Co., New York.

PIPE THREADING & CUTTING MACHINES
Crane Co., Chicago, Ill.

PIPE, STEEL
Crane Co., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PRESSURE REDUCING VALVES
(See Regulators, Pressure).

PULLEYS, VARIABLE SPEED

PUMPS, ACID RESISTING
Duriron Co., Inc., The, Dayton, O.

PUMPS, CENTRIFUGAL
American Steam Pump Co., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, CENTRIFUGAL, VACUUM HEATING
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

PUMPS, CONDENSATION
Ames Pump Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.

PUMPS, OIL
Janette Mfg. Co., Chicago, Ill.
Nugent & Co., W. W., Chicago, Ill.

PUMPS, RECIPROCATING STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.

PUMPS, SUMP
Chicago Pump Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, TURBINE
Ames Pump Co., New York.
Foster Wheeler Corp., New York.
Nash Engineering Co., So. Norwalk, Conn.

PUMPS, VACUUM
Ames Pump Co., New York.
Chicago Pump Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foster Wheeler Corp., New York.
Janette Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.

RADIATION, LIGHT WEIGHT, NON FERROUS
American Radiator Co., New York.
McQuay Radiator Co., Chicago, Ill.
The Herman Nelson Corp., Moline, Ill.
Rome Brass Radiator Corp., New York.
Rome Turney Radiator Co., Rome, N. Y.
Thermal Units Co., Chicago, Ill.
Trane Co., The, La Crosse, Wis.
Winchester Repeating Arms Co., New Haven, Conn.
Young Radiator Co., Racine, Wis.

RADIATOR ENCLOSURES AND SHIELDS
McQuay Radiator Corp., Chicago, Ill.
Schleicher Inc., Gary, Ind.

RADIATOR HANGERS
American Radiator Co., Buffalo, N. Y.
Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Corp., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.

RADIATORS, CABINET AND CONCEALED
Air-Way Electric Appliance Corp., Toledo, Ohio.
Fintube Radiator Co., Long Island City, N. Y.
McQuay Radiator Corp., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Rome Brass Radiator Corp., New York.
Thermal Units Co., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Radiator Co., Racine, Wis.

RADIATORS, CAST-IRON
American Radiator Co., Buffalo, N. Y.
Burnham Boiler Corp., Irvington, N. Y.
Crane Co., Chicago, Ill.
Kewanee Boiler Corp., Kewanee, Ill.
Modine Mfg. Co., Racine, Wis.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.

RADIATORS, GAS FIRED
Automatic Gas Steam Radiator, Pittsburgh, Pa.

RECEIVERS, AIR
Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

RECEIVERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
The Stack Heater Co., Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

REFRIGERATING APPARATUS
Vilter Mfg. Co., Milwaukee, Wis.

REGULATORS, BOILER-FEED
Atlas Valve Co., Newark, N. J.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
The Stack Heater Co., Boston, Mass.
Watts Regulator Co., Lawrence, Mass.

REGULATORS, DAMPER
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
The Stack Heater Co., Boston, Mass.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
White Mfg. Co., St. Paul, Minn.

REGULATORS, PRESSURE
American District Steam Co., North Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kainer & Company, Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
O-E Specialty Mfg. Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
The Stack Heater Co., Boston, Mass.
Watts Regulator Co., Lawrence, Mass.

REGULATOR, PRESSURE, GAS
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

REGULATORS, TEMPERATURE
(See Temperature Control)

SEPARATORS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

SEPARATORS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

SPRAY COOLING SYSTEMS
Badger & Sons Co., E. B., Boston, Mass.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

SPRAY NOZZLES
(See Nozzles, Spray)

STERILIZER, WATER
U. S. Ozone Corp., Scottdale, Penn.

STOKERS, MECHANICAL
Brownell Co., Dayton, Ohio.
Domestic Stoker Co., New York.
General Stoker Corp., New York.

STRAINERS, OIL
Bishop & Babcock Sales Co., Cleveland, Ohio.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Janette Mfg. Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Nugent & Co., W. W., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, WATER
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

TEMPERATURE CONTROL
American Radiator Co., Buffalo, N. Y.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Penn Electric Switch Co., Des Moines,
Raymond, F. I., Chicago, Ill.
Sarco Co., Inc., New York.
Sheer Co., H. M., Quincy, Ill.
Sterling Engineering Co., Milwaukee, Wis.
The Stack Heater Co., Boston, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Trane Co., The, LaCrosse, Wis.
Watts Regulator Co., Lawrence, Mass.
White Mfg. Co., St. Paul, Minn.

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THERMOMETERS, RECORDING AND INDICATING

American Radiator Co., Buffalo, N. Y.
Bristol Co., The Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.

THERMOSTATS

Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Marsh & Co., Jas. P., Chicago, Ill.
Mercoid Corporation, Chicago, Ill.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Modine Mfg. Co., Racine, Wis.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Time-O-Stat Controls Co., Elkhart, Ind.

TRAPS, BUCKET

Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT

Crane Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York.
Swartwout Co., Cleveland, Ohio.

TRAPS, FLOAT & THERMOSTATIC

Dunham Co., C. A., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sarco Co., Inc., New York, N. Y.

TRAPS, INVERTED BUCKET (STEAM AND AIR)

Armstrong Machine Wks., Three Rivers, Mich.

TRAPS, LIFTING

Crane Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Swartwout Co., Cleveland, Ohio.

TRAPS, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
Armstrong Machine Wks., Three Rivers, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York City.
Webster & Co., Warren, Camden, N. J.

TRAPS, RETURN

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TRAPS, STEAM

American Blower Co., Detroit, Mich.
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Connor Co., Inc., The W. B., New York.
Crane Co., Chicago, Ill.
Davis Engineering Corp., New York.
Dunham Co., C. A., Chicago, Ill.
Wm. S. Haines & Co., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill
Sarco Co., Inc., New York.

TRAPS, VACUUM

American Blower Co., Detroit, Mich.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Wm. S. Haines & Co., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

TUBING, COPPER AND BRASS

Crane Co., Chicago, Ill.
Wolverine Tube Co., Detroit, Mich.

TURBINES, STEAM

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

TURBO-BLOWERS

Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

UNIT HEATERS

(See Heaters, Unit)

VACUUM CLEANING APPARATUS

American Radiator Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES, ACID RESISTING

Crane Co., Chicago, Ill.
Duriron Co., Inc., The, Dayton, O.

VALVES, AIR, AUTOMATIC

American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corp., New York.
Hoffman Specialty Co., New York.
Jenkins Bros., New York.
Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm., H., New York.
Powers Regulator Co., Chicago, Ill.

VALVES, AIR RELIEF

American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Gorton Heating Corp., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Sarco Co., Inc., New York.
The Stack Heater Co., Boston, Mass.
Trane Co., The, LaCrosse, Wis.

VALVES, BACK PRESSURE

Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, BALANCED

Crane Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Watts Regulator Co., Lawrence, Mass.

VALVES, BLOW-OFF

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, CHECK

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.
Time-O-Stat Controls Co., Elkhart, Ind.
Watts Regulator Co., Lawrence, Mass.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Crane Co., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Walworth Co., New York.

VALVES, MAGNETIC

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
Time-O-Stat Controls Co., Elkhart, Ind.

VALVES, NON BY-PASS

The Stack Heater Co., Boston, Mass.

VALVES, NON-RETURN

Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Walworth Co., New York.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Crane Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corp., New York.
Wm. S. Haines & Co., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
National Radiator Corp., Johnstown, Pa.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Walworth Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, PRESSURE REDUCING

(See Regulators, Pressure)

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Crane Co., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kainer & Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Mueller Co., Decatur, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Walworth Co., New York.

VALVES, VACUUM RELIEF

The Stack Heater Co., Boston, Mass.
Watts Regulator Co., Lawrence, Mass.

VALVES, RELIEF (WATER)

Crane Co., Chicago, Ill.
Kainer & Co., Chicago, Ill.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mueller Co., Decatur, Ill.
National Radiator Corp., Johnstown, Pa.
The Stack Heater Co., Boston, Mass.

VALVES, SAFETY

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
The Stack Heater Co., Boston, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Walworth Co., New York.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
National Regulator Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

VENTILATING SYSTEMS, ACID

Duriron Co., Inc., The, Dayton, O.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, FLOOR

Aeolus Dickinson, Chicago, Ill.
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill.

VENTILATORS, ROOF

Aeolus Dickinson, Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Peerless Unit Ventilation Co., Inc., Bridgeport, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

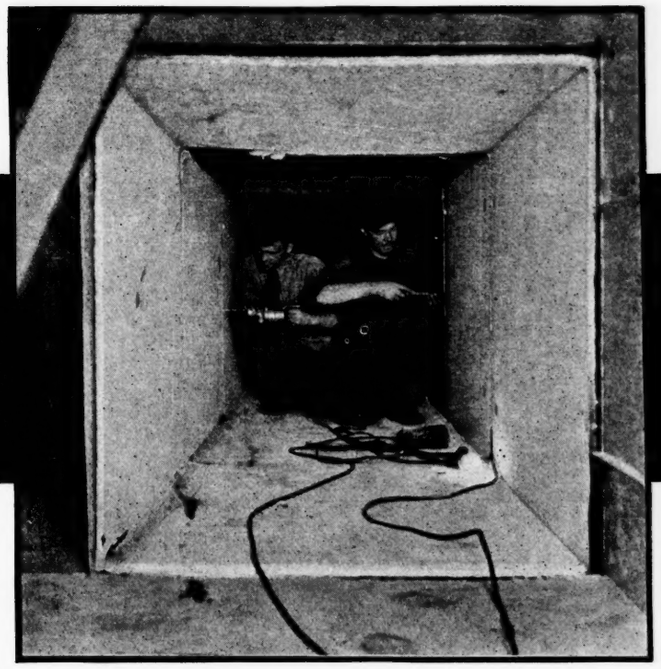
WATER STERILIZERS

WRENCHES, STILLSON

Walworth Co., New York.

ZONE HEATING SYSTEMS

Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Webster Talmadge, New York.



INSULITE *for Air Duct Insulation and Sound Absorption*

the Wood-Fiber Insulating Board

WHEN YOU insulate air ducts in a theater or any other large building you need an insulation material that will maintain the air at a desired temperature while it is being forced through the ducts. You also need a material that will absorb fan and motor noise. Insulite, an all wood-fiber board, not only efficiently insulates but in addition effectively absorbs sound.

The insulation efficiency of Insulite is great because of its low thermal conductivity. Laboratory tests prove that this full ½ inch thick board gives 12½% more efficient insulation than ordinary 7/16 inch insulating boards. It is this insulation efficiency of Insulite that permits air being carried for long distances with little or no change in temperature.

Another scientific test shows that Insulite has a high and very uniform sound absorbing coefficient, which recommends it as an air duct lining. When Insulite is used, fan and motor noise is deadened long before it reaches the outlet.

The large panels of Insulite are easy to install either on a new job or old job, but especially so on new work, as Insulite can be applied to the sheet iron in the shop and erected as a unit on the job.

Insulite is made from the strong, tough fibers of spruce and other northern woods — it is chemically treated to resist moisture and is not subject to rot or disintegration.

Insulite has many superior insulating features that you should know about. May we send you additional information? Our Engineering Department will be glad to help you.

THE INSULITE COMPANY
(A Backus-Brooks Industry)
1200 Builders Exchange, Dept. 29A, Minneapolis, Minn.

Gentlemen: Please send me additional information on Insulite. Also a sample.

Name .....

Address .....

City ..... *State* .....

INSULITE

the Wood-Fiber Insulating Board

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DURIRON exhaust fans handle corrosive fumes as fans of ordinary materials handle pure air.

Chemical hoods and laboratories, battery stations, pickling, plating and bright dipping operations are served by fans of this acid-resisting alloy.

Simple and efficient design assures long life and day-in-and-day-out operation with minimum attention.

All types of discharge are possible.

Both motor and belt drive. Capacities to 5,000 cubic feet per minute.

Engineering consultation without obligation. A bulletin for the asking.

The Duriron Company, Inc.
DAYTON, OHIO

A Division of The Industrial Alloy Products Corporation

DURIRON
FOR ACID SERVICE

124th Field Artillery Armory, 53rd Street and Cottage Grove Avenue, Chicago, Illinois.

Here 120,000 square feet of Celotex Roof Insulation Board were applied in a thickness of 1 inch to conserve costly heat. The Celotex was laid over a cement tile deck in a mopping of asphalt and nailed to prevent slipping on the steep grade.

Through poorly insulated roofs

hundreds of dollars worth of heat is leaking away

UNINSULATED roofs are too costly to be tolerated. So heating engineers and architects specify Celotex Roof Insulation Board, with its low thermal conductivity, to conserve costly heat.

In hundreds of manufacturing plants, Celotex insulated roofs are paying big dividends in fuel savings. And productive working temperatures are maintained with less radiation and smaller heating plants.

Your labor produces more and better work when shielded from winter cold and scorching summer heat with Celotex Roof Insulation Board.

Ceiling condensation no longer results in damage to machinery and equipment. For Celotex Roof Insulation Board keeps ceiling temperature above the dew-point where condensation takes place.

The low cost of application is a vital factor. Celotex Roof Insulation Board is quickly and easily applied on new or old buildings . . . over wood, concrete or metal roof decks or over old, built-up roof covering, where it is then covered with a new built-up roof.

It comes in boards measuring 2′ by 5′ with a thickness of approximately ½″. . . and also in laminated multiples of from 2 to 8 plies, thus permitting the application of several layers in one operation.

Write for our folder *Dividends from Proper Roof Protection,* containing carefully tabulated data on the actual savings in fuel and radiation obtained with Celotex Roof Insulation Board.

Our own engineers will gladly cooperate with you in solving any individual problems you care to present.

The word

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Is the trademark of and indicates manufacture by The Celotex Company, Chicago, Ill.

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Mills: **New Orleans, Louisiana**
Branch Sales Offices in many principal cities
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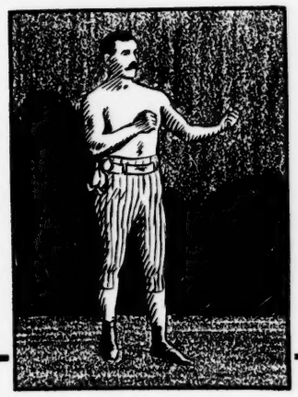
Other Offices in Principal Cities

See our exhibit — BOOTHS 560-561

HEATING AND VENTILATING

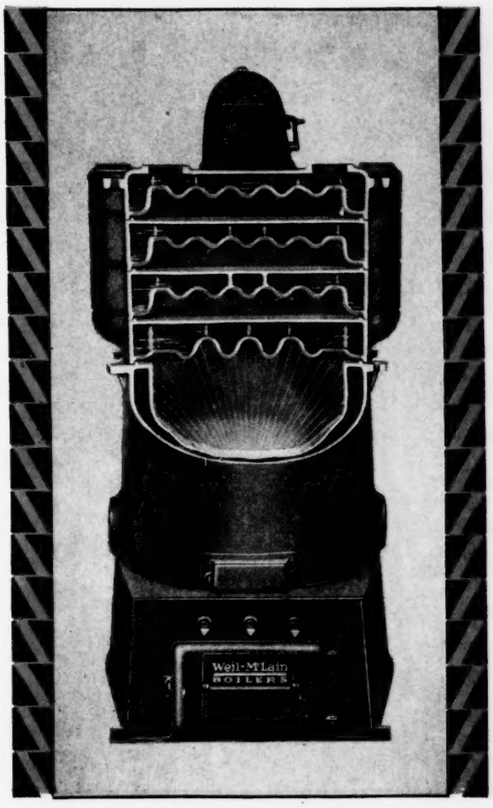
FAMOUS FIGHTERS



John L. Sullivan

At 19, "the Boston Strong Boy" fought his first public battle on the stage of a theater when he knocked out a pugilist who had challenged any man in the audience. In 1882 he defeated Paddy Ryan in a bare-knuckle fight for $5000 and the championship of America. In 1888 his fight with Charlie Mitchell ended in a draw in the 39th round. His greatest fight took place in 1889 when he fought Jake Kilrain 75 rounds! He remained champion for 12 years until defeated by Jim Corbett in 21 rounds at New Orleans in 1892. His courage, pugnacity and herculean strength made him a picturesque figure throughout his exciting career.

Weil-McLain Boilers *are famous for fighting fuel waste*



There are two good reasons why Weil-McLain Round Boilers, for example, are so successful in fighting fuel and heat waste. They make two of the most powerful features that ever helped to sell boilers.

Fuel-saving corrugations like this ∿∿∿

The Weil-McLain Round Boiler gives more heat and saves fuel because all the vital heat-absorbing surfaces are corrugated like this ∿∿∿∿, instead of flat like this _____. You can easily see that the wavy line crowds more heating surface into the same space.

It is easy to show home owners that 30 to 40 per cent more vital heating surface thus added to Weil-McLain Round Boilers enables them to heat their homes with less fuel.

Balanced back-and-forth fire travel

More heat is actually utilized in Weil-McLain Boilers because Weil-McLain fire travel is not only back and forth but it is balanced. Variations in the rate at which boilers operate due to varying heat demands do not alter the long, balanced back-and-forth flow of gases through the flues.

In the complete line of Weil-McLain Boilers you will find many other features—scientific principles of design that enable these boilers to fight fuel waste and deliver more heat. The line includes Round Type, Jacketed, Square, Self-feed and Smokeless Boilers. Also Weil-McLain "Cameo" Radiators.

WEIL-McLAIN COMPANY, General Office: Chicago
Boiler Plant and Offices: Michigan City, Ind.
Radiator Plant and Offices: Erie, Pa.

Jobbing distributors with local stocks in most jobbing centers

Weil-McLain
SCIENTIFIC COMBUSTION
BOILERS
fight fuel waste and deliver more heat

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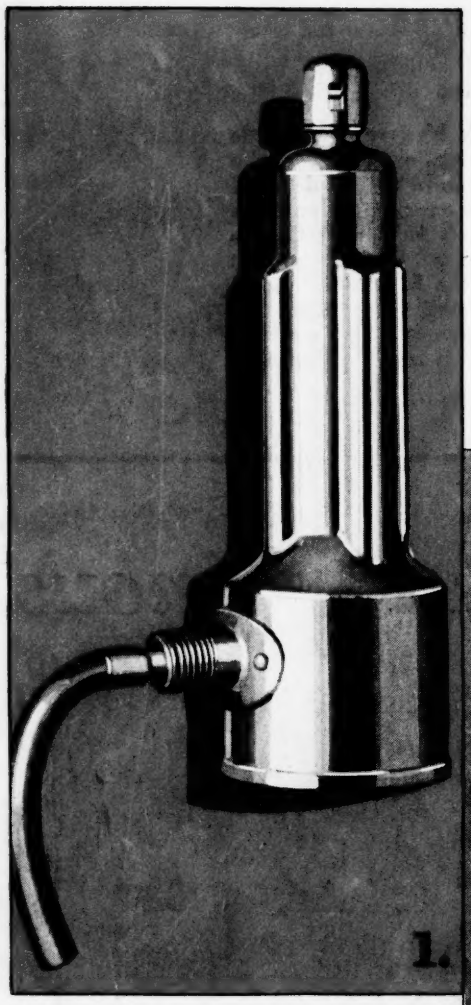


MODERN HEATING
for all types of Buildings

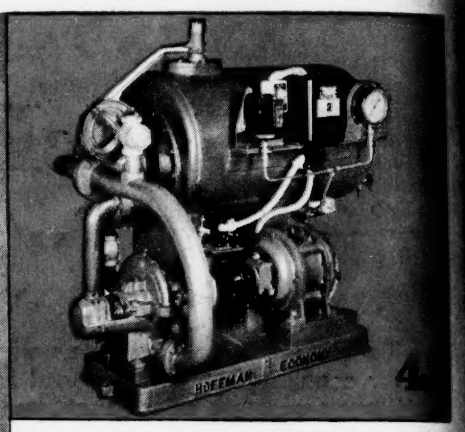
For all types of structures—from a modest home to a towering skyscraper—from a small retail store to a large industrial plant—Hoffman Heating Equipment offers a dependable line of modern heating specialties. The selection of complete Hoffman Equipment simplifies specifications and purchasing, provides competent engineering counsel and avoids divided responsibility. Hoffman Specialty Company, Inc., Dept. C-59, Waterbury, Conn.

1. ***With Hoffman No. 2 Valves,*** any ordinary one-pipe steam system can be converted into a modern vacuum system. Radiators heat up in 15 minutes instead of an hour — remain hot for three hours instead of one hour after fires are banked — and fuel costs are reduced about $5.00 per radiator per year (except in very mild climates). Because of patented double air lock, Hoffman Valves pull and hold maximum vacuum under all operating conditions.

2. ***Hoffman Controlled Heat*** is the simplest of vapor vacuum systems to install—the most dependable to operate. Because of the dual adjustment provided by the No. 7 Modulating Valve, the Contractor can balance up the system with scientific accuracy—the user has finger touch control

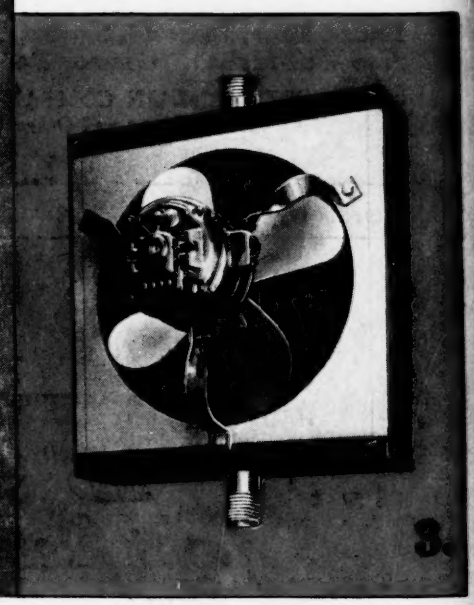
of the heat output of each radiator at all times. Fuel consumption is automatically regulated by amount of heat needed, thus insuring low-cost operation.

3. ***Hoffman Moto-Heaters*** provide modern, efficient heating for all types of industrial and commercial buildings. They generate heat over the heads of the workers and distribute it directly to the working zone. Made in floor mounted and suspended types or with outside



air intake and recirculating chamber in a complete range of sizes, for pressures up to 200 lbs.

4. ***Hoffman-Economy Pumps*** are made in a complete range of types and sizes for all heating requirements: Vacuum Pumps, Horizontal Condensation Pumps, Reciprocating Pumps, Vertical Underground Pumps and Air Line Pumps. All units are scientifically designed, sturdily constructed and equipped with motors of standard size and make.



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HEATING AND VENTILATING
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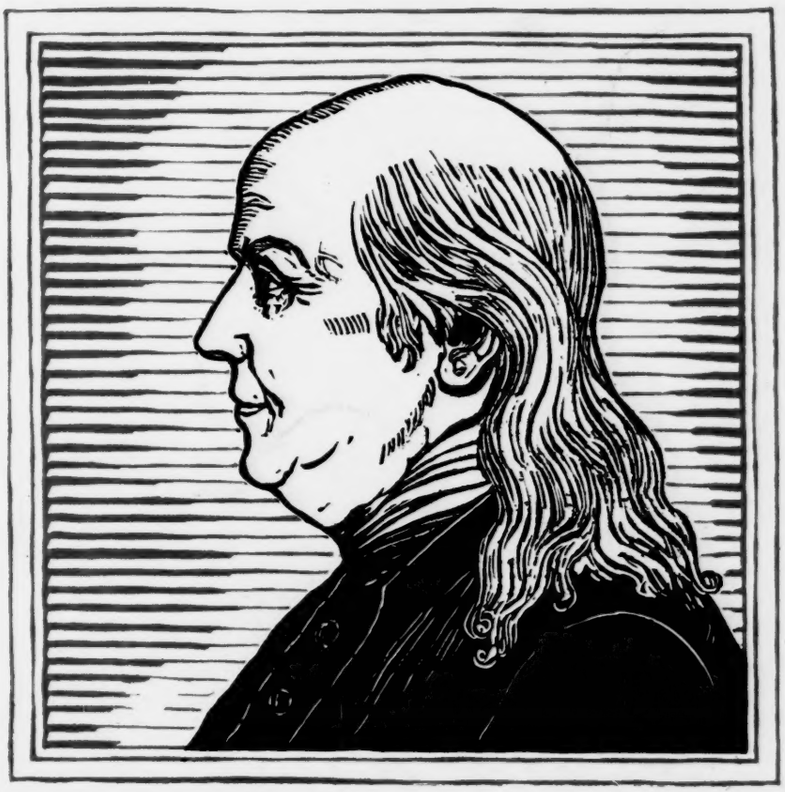

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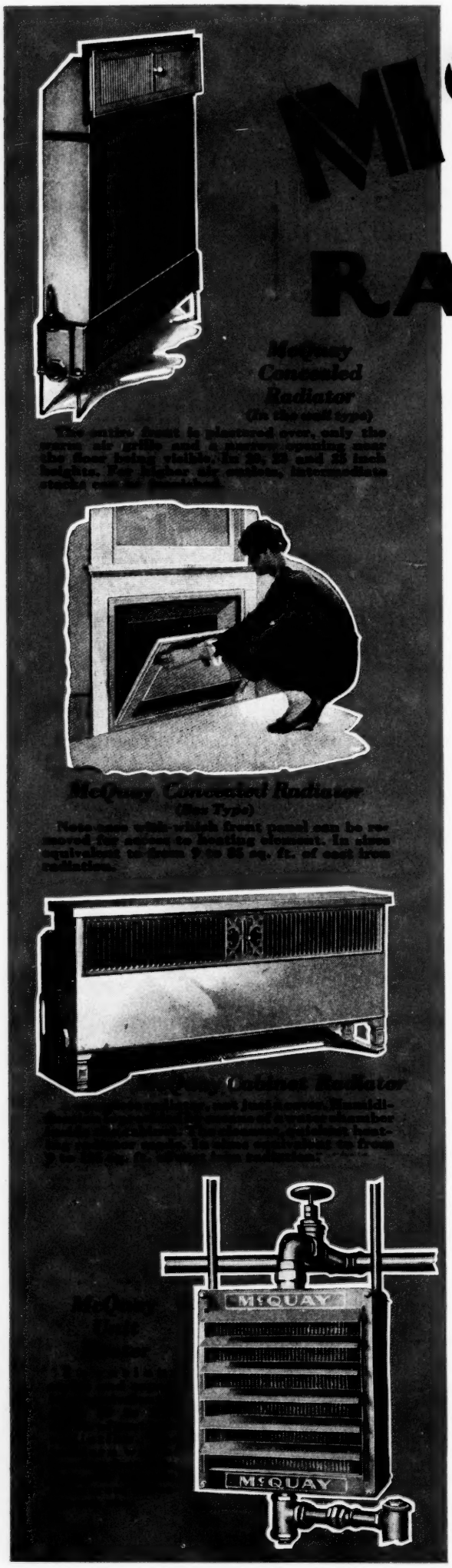
American Society of Heating
And Ventilating Engineers

●

1930



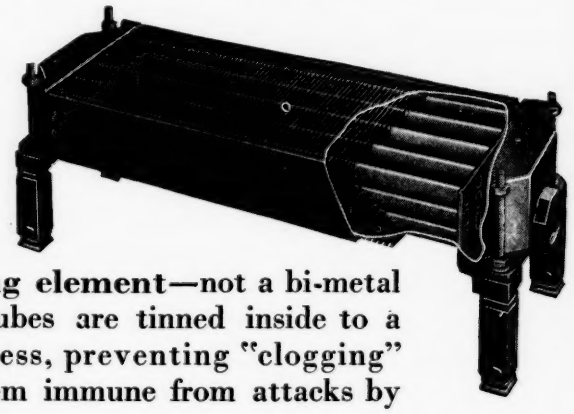
McQUAY Modern RADIATORS

To conform with the heating requirements of modern buildings, here is a complete line—consisting of Cabinet and Completely Concealed Radiators and Unit Heaters—in types, capacities and dimensions *for every heating need.*

Clean, Comfortable Heat

Cleaner, more comfortable heat is provided because McQuay Radiators send the warmed air out in a horizontal direction (instead of up against the walls and drapes) *with sufficient initial velocity to provide complete circulation.*

All-Copper Heating Unit



A distinctive feature of all McQuay Radiators and Unit Heaters is the **all-copper, totally welded heating element**—not a bi-metal element. The tubes are tinned inside to a glassy smoothness, preventing "clogging" and making them immune from attacks by impure water.

Accurately Rated

A McQuay rated to heat 50 sq. ft. will heat that amount. Nothing needs be added to the ratings. With the concealed types no additional capacity need be added because of recessing.

Ask for Complete McQuay Bulletins

Complete engineering data, sizes, specifications and installation instructions are contained in separate bulletins which will be sent on request. Or ask our nearest office.

McQUAY RADIATOR CORPORATION
General Offices, 35 East Wacker Drive, Chicago
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MERCOID CONTROLS

ARE USED ON ALL MAKES OF UNIT HEATERS. LEADING OIL BURNERS ARE MERCOID EQUIPPED. THEY REPRESENT THE HIGHEST EFFICIENCY IN AUTOMATIC CONTROL REQUIREMENTS

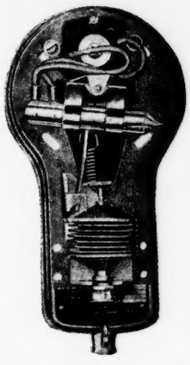


Figure 21

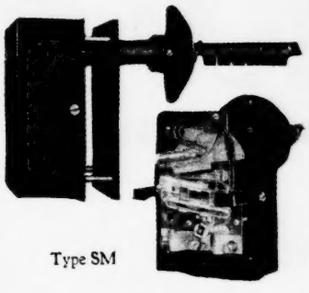
Thermostat

For dependable automatic control of air temperature

Figure M-51

Furnace Control

Protection against overheating Used also with booster fans



Type SM

Pyratherm

(with adjustatherm)

A complete stack safety control

INSURED PERFORMANCE

MERCOID CONTROLS are constructed with the utmost precision. Every possible care is taken to insure perfect performance. They are easily installed, free from service expense and replacements. They are designed for direct control of motors where the normal working loads do not exceed 10 amperes at 110 volts or 5 amperes at 220 volts, A.C. or D.C. Where used as pilot switches, in series with the proper starting switches, they will control motors of the largest size. Write for catalog H-5 Address Dept. S

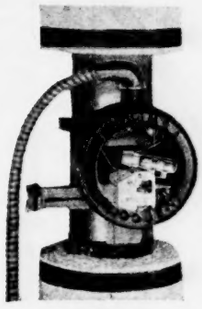


Figure 35

Risertherm

Surface type control for hot water heating systems

Figure 31

Pressure Control

A positive safety limiting devise for steam boilers

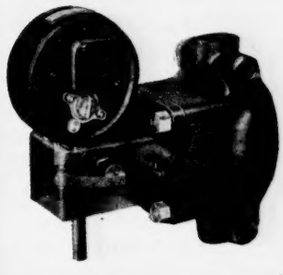


Figure 71

Low Water and Pressure Control

Has many applications

THE MERCOID CORPORATION

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CHICAGO, ILLINOIS

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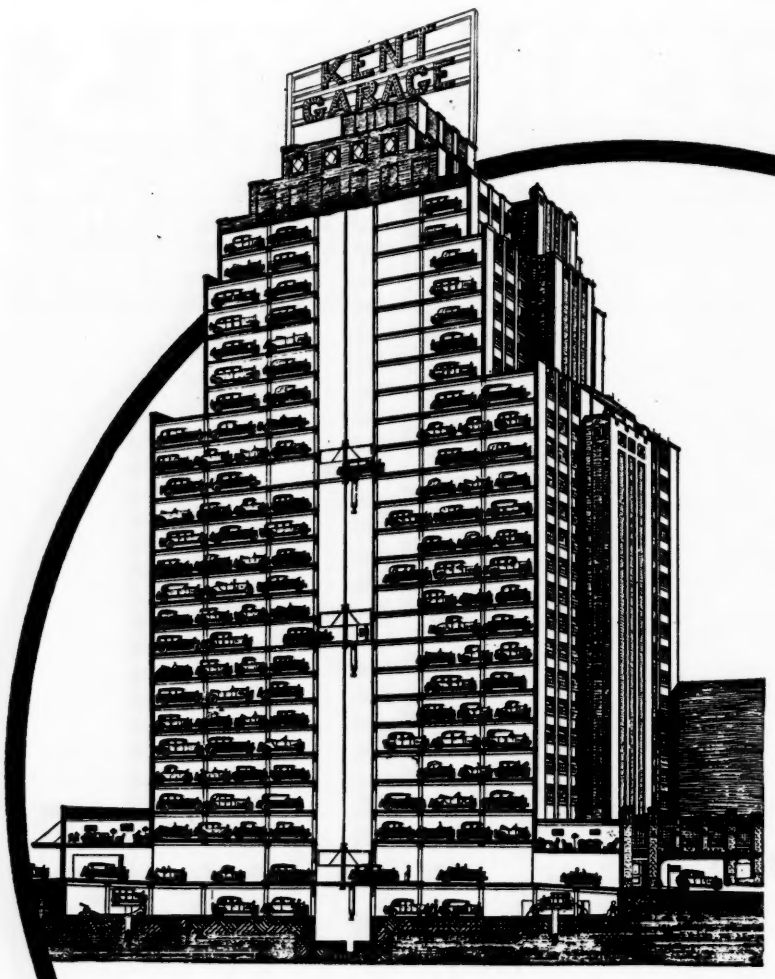
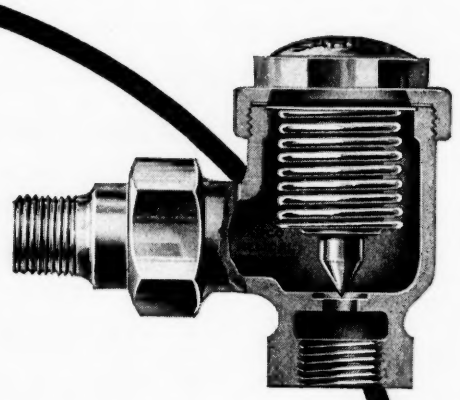
25 CHURCH ST.

SAN FRANCISCO
1129 FOLSOM ST.

USED THE WORLD OVER
MERCOID CONTROL





KENT AUTOMATIC GARAGE
NEW YORK
Jardin, Hill & Murdock, Architects

World's Tallest Garage Selects SARCO Radiator Traps

THIS 24-story garage has a capacity for 1,000 automobiles. Cars are taken on the elevators automatically at the street level and automatically removed by an electric parker. All parking is done by electricity — no human hand touches the cars.

There are 234 Sarco Radiator Traps in the heating system of this gigantic garage, while Sarco combination float and thermostatic Steam Traps were installed on all unit heaters and drips.

The larger and more important the building is, the greater is the responsibility of selecting its equipment. It is in buildings of this type that you will usually find Sarco Traps. For architects, engineers and contractors know that Sarco Traps have given dependable service for years and years and that they are backed by an old, responsible concern who "makes good" promptly, without question or quibble, if ever needed.

Write for Catalog P-75, or mail the coupon

SARCO CO., Inc.

183 Madison Ave. **New York City**

Boston Chicago Detroit Pittsburgh
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Sarco (Canada) Limited, 1605 Delorimier Ave., Montreal.

SARCO
Radiator Traps

A Good Heating System

SARCO CO., Inc.,
183 Madison Ave., New York.

Without any obligation on our part, you may send a copy of your Booklet P-75.

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Editorial

IN THE years to come, heating men will look back upon the First International Heating and Ventilating Exposition as a turning point in the evolution of the industry. The exhibits mark definitely the transition from the Old to the New, with special reference to such items as the unit heater method of warming industrial buildings, the rapid adoption of air conditioning, with its means for the control of humidity and temperature and for cleaning the air, as applied not only to process work but to public and office buildings, the substitution of pipe and duct welding for the older method, the acceptance of unit ventilators, the adoption of building insulation as an integral part of the heating equipment, the modern method of concealing radiators and of beautifying the heating system generally and refinements in the methods of economizing heat with zone control. Through the participation of the coal, gas and oil interests, the exposition records, in a dramatic manner, the arrival of Automatic Heat, exemplified by the domestic stoker, the oil burner and gas-burning equipment, each with its automatic controls.

What makes the exposition of particular timeliness is the fact that the 10,000 or more architects, engineers, contractors, public health officials and others who will attend the show, will see the heating and ventilating industry in its present advanced state, with scarcely a trace of the slow and laborious course it traveled before reaching its present standing.

JUST as the June Silver Anniversary issue of HEATING AND VENTILATING portrayed the evolution of the industry during the past quarter-century, so this International HEATING AND VENTILATING Exposition Supplement looks toward the future. Every one agrees that we are on the verge of greater things than the industry has yet known —that buildings of the future will be made comfortable in winter and summer alike, irrespective of the outdoor weather conditions. The status of coal, oil, gas and electricity is changing almost from month to month and it would be a rash prophet who would attempt to predict just what the heating system of the future will look like. When it comes to house cooling, we are told on other pages of this issue what is happening in this direction. Hints from responsible quarters of pending announcements in connection with electric cooling add further zest to a situation already full of interesting possibilities.

ACCORDING to present plans, the International Heating and Ventilating Exposition will be held bi-annually, or every other year, in conjunction with the annual meeting of the American Society of Heating and Ventilating Engineers. HEATING AND VENTILATING has arranged to publish a special Exposition Supplement simultaneously with each exposition. In the intervening years in which no exposition is held, the January issue will be devoted largely to articles and other subject matter dealing with the major trends in the industry.

FOR the first time, HEATING AND VENTILATING is enabled to present a fairly accurate picture of the value, in dollars and cents, of the heating and ventilating business. This forecast is based upon the building construction survey for 1930, conducted by the Building Division of National Trade Journals, supplemented by an independent survey of our own. As a result, HEATING AND VENTILATING is enabled to state that approximately $634,788,690 will be spent in 1930 for heating and ventilating equipment for new buildings. This does not take into account the value of replacement work or the imposing amount of miscellaneous equipment, which will be utilized for other purposes than those directly connected with heating, ventilating and air conditioning. Some idea of the diversity of these uses is to be gained from the illustrations on other pages covering that very point.

HEATING AND VENTILATING'S Forecast will be a regular feature, appearing each year in January. As additional surveys are made it will be possible, no doubt, to supplement the data with further figures and estimates pertaining to the various products comprising the industry's output. In that way, the forecast will form an authoritative guide such as the industry has never had until now for determining the year's prospects.

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A. S. Armagnac, Editor; Clifford Strock, Associate Editor; Cliff W. Presdee, Advertising Manager; Gustave Petersen, Special Representative; William F. Steeg, Western Manager; European Representative, W. G. Hollinworth, Somerleyton Road, Oulton, Lowestoft, England.

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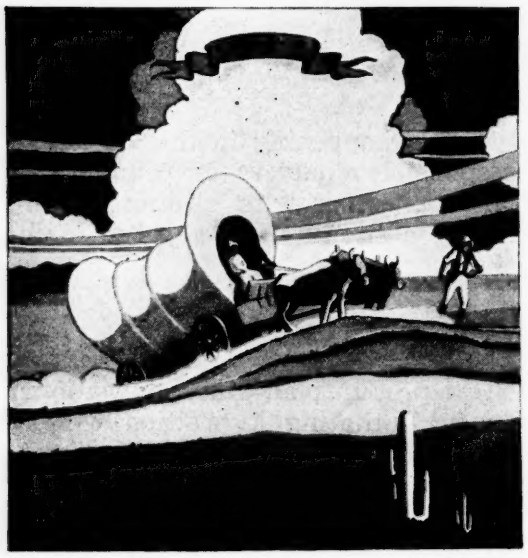
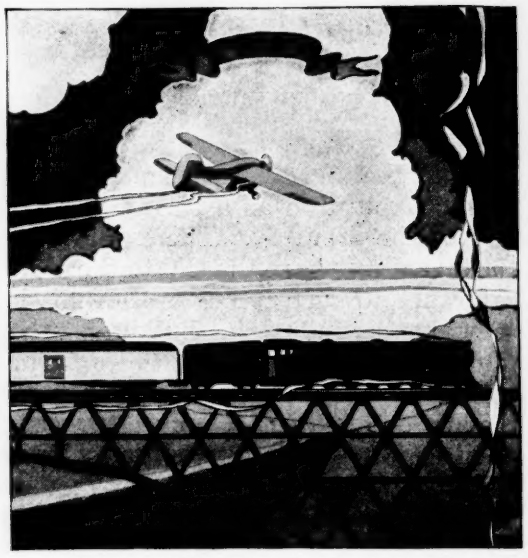
AMERICAN DISTRICT STEAM COMPANY.

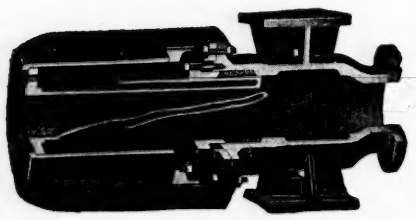




OVER FIFTY YEARS IN BUSINESS

VISIT THE ADSCO EXHIBIT AT THE SHOW

Complete Display of the latest Improvements in Steam Line Equipment



Duplex Sleeve Guided Expansion Joint

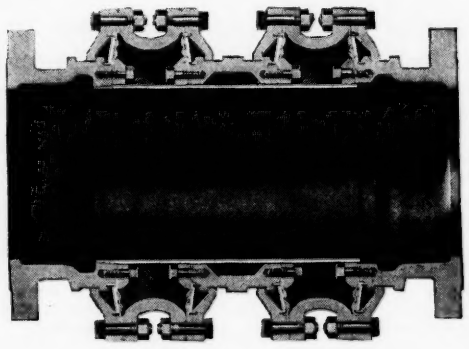
FOR more than fifty years, ADSCO designers, engineers and builders have concentrated on the production of equipment for steam transmission and distribution . . .

The result of this concentrated effort is manifest in the extensive line of ADSCO products today, which will be exhibited at the International Heating & Ventilating Exposition, Philadelphia, January 27th to 31st, 1930. Here you will see the latest improvements in slip type and packless expansion joints . . . as well as other ADSCO products that contribute to the efficiency, long service, and economy of District Heating and other piping and heating installations. Wherever District Heating is known, wherever expansion joints are used, and wherever major piping installations require modern equipment, the name of the American District Steam Company is recognized as one of the earliest pioneers and outstanding leaders . . .

ADSCO extends to you a most cordial invitation to visit booths 942 and 943. If you will make yourself known to our representatives at the exhibit, they will be glad to explain our equipment, and discuss with you any problems confronting you, related to pipe line installations.

Back of ADSCO Service and ADSCO Equipment is more than a half-century of experience, which you can apply to your benefit through the use of ADSCO Products.

Whether you plan to attend the exposition or not, feel free to ask for complete information on ADSCO Equipment.



Multiple Diaphragm Variator

ADSCO

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

OVER FIFTY YEARS IN BUSINESS

IN Philadelphia, 160 years ago, Benjamin Franklin and his friends basked in the warmth of the stove he had invented—the forerunner of central house-heating systems. ♦ This was the only marked improvement in heating until the advent of radiator heat seventy-five years later. ♦ From this crude stove has developed the $600,000,000 a year industry, which, with its hundreds of diversified products, we know today as heating and ventilating.

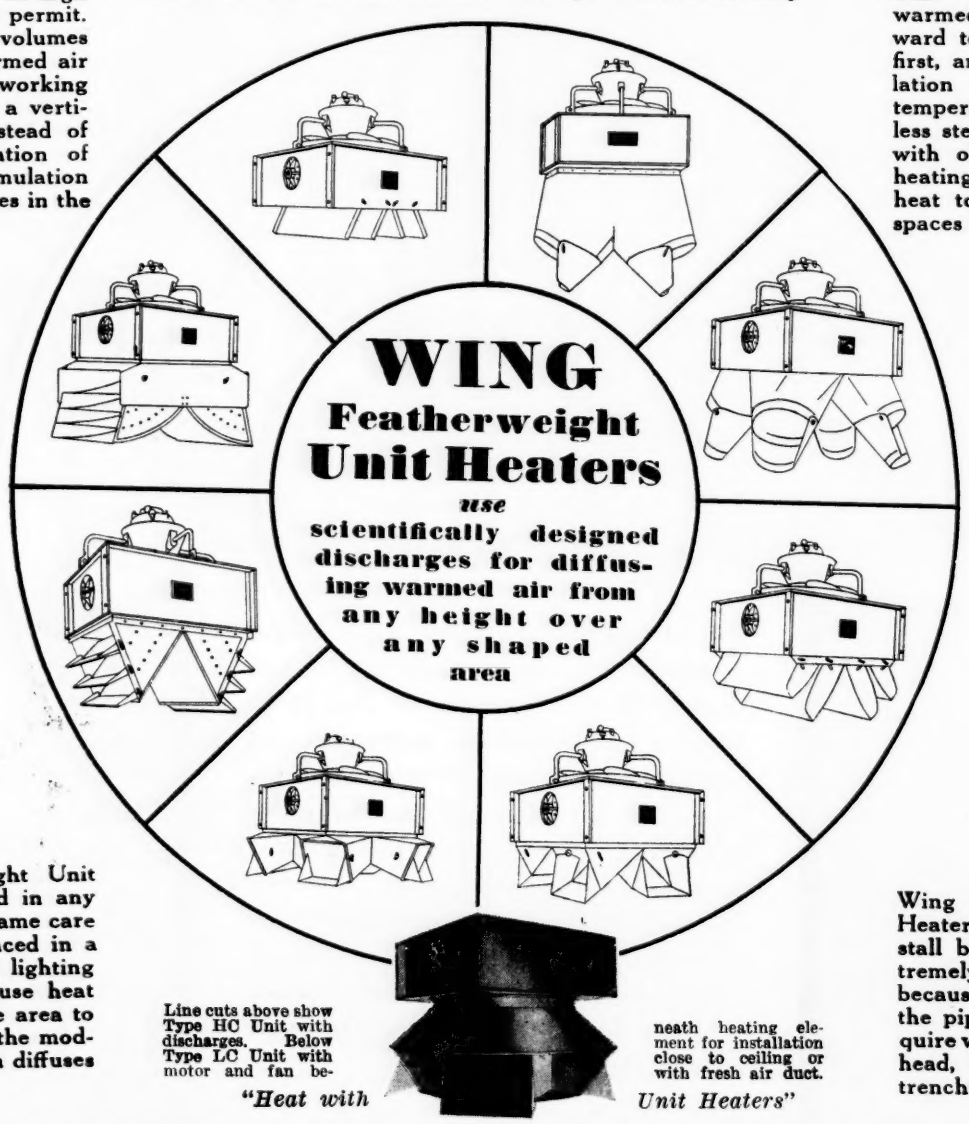
WING FEATHERWEIGHT

Heating from Directly Overhead

with Wing Featherweight Unit Heaters
gives uniform distribution—comfort and economy

Wing Featherweight Unit Heaters are placed as high as conditions will permit. They direct large volumes of comfortably warmed air downward to the working level. Maintaining a vertical downward (instead of horizontal) circulation of air, prevents accumulation of high temperatures in the upper spaces.

Since Wing Featherweight Unit Heaters deliver warmed air vertically downward to the working level first, and because accumulation of high overhead temperatures is prevented, less steam is required than with old style systems of heating which allow the heat to rise to the upper spaces first.



Wing Featherweight Unit Heaters are placed in any Building with the same care that lights are placed in a modern scientific lighting system. They diffuse heat uniformly over the area to be heated, just as the modern lighting system diffuses light uniformly.

Line cuts above show Type HC Unit with discharges. Below Type LC Unit with motor and fan beneath heating element for installation close to ceiling or with fresh air duct.

"Heat with Unit Heaters"

Wing Featherweight Unit Heaters cost so little to install because they are extremely light in weight and because of the simplicity of the piping system they require which is entirely overhead, thus rendering pipe trenches unnecessary.

The heating engineer finds planning a heating system with Wing Featherweight Unit Heaters extremely simple because of the freedom of location made possible by their overhead position. It is not necessary to study the interference with production lines, men and machinery. Floor space is left entirely clear and unobstructed.

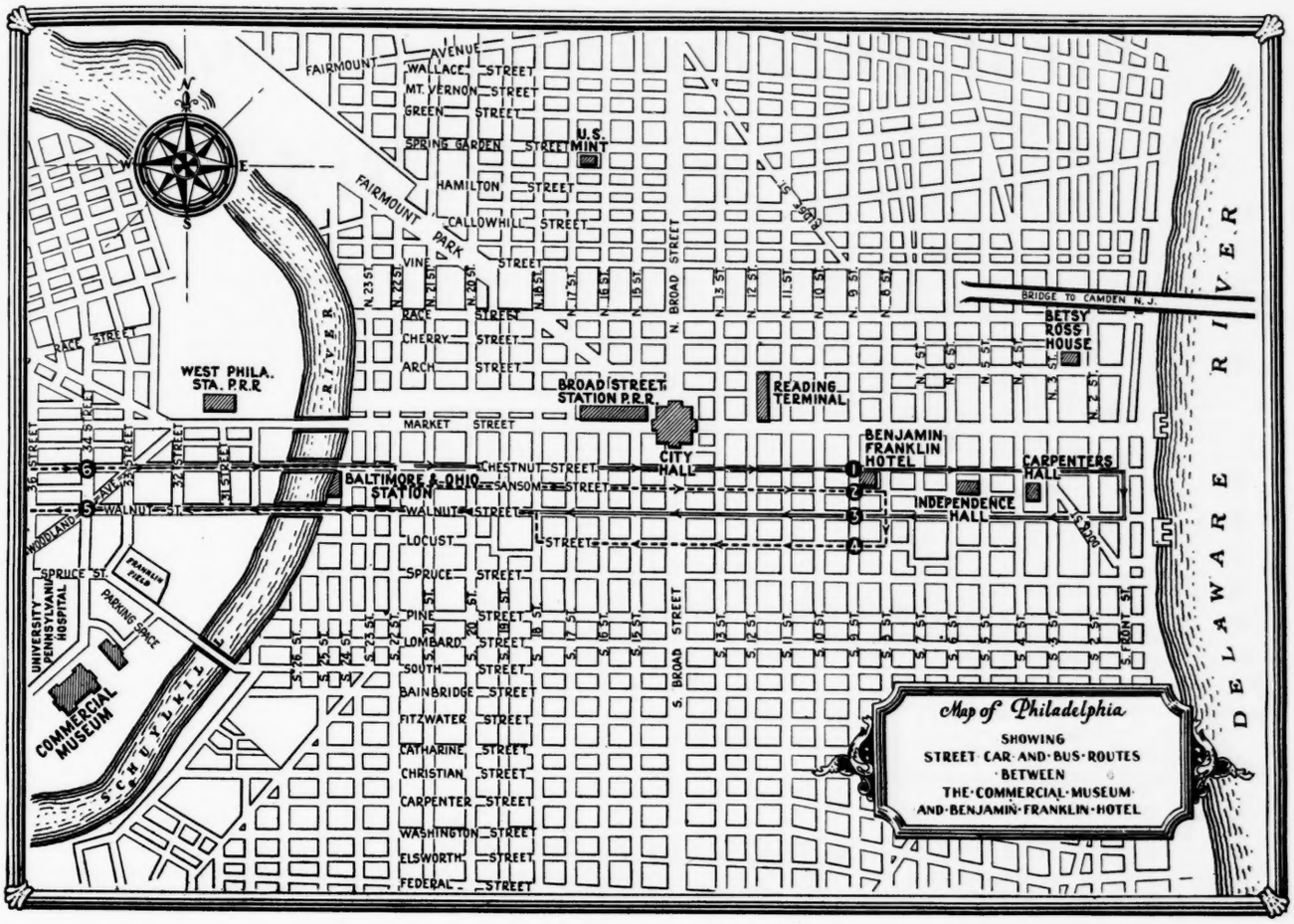
The new Wing Heater Catalogue contains considerable data of assistance to the engineer planning a Wing installation, and Wing engineers will gladly assist with the more unusual problems.

See the Wing display at Booth No. 305-6 at the International Heating and Ventilating Exposition, January 27-31 at the Commercial Museum in Philadelphia.

Page 65 of this issue describes Wing Forced Draft Blowers.

L. J. Wing Mfg. Company, Dept. 21, 158 W. 14th St., New York, N. Y.

UNIT HEATERS



How to Reach the Exposition

SURFACE CARS (*Double Lines on Map*)

Benjamin Franklin Hotel to Commercial Museum—Board cars marked 13 or 42 at Walnut and Ninth Streets (3) and get off cars at Woodland Avenue and Walnut Streets (5).

Commercial Museum to Benjamin Franklin Hotel—Board cars marked 13 or 42 at Woodland Avenue and Walnut Streets (5) and get off at Chestnut and Ninth Streets (1).

On cars marked 13 and 42 "pay as you pass" the conductor. The fare is 8 cents, or two tokens for 15 cents.

BUSSES (*Dotted Lines on Map*)

Benjamin Franklin Hotel to Commercial Museum—Board bus marked Route D at Locust and Ninth Streets (4) and get off at Woodland and Walnut Streets (5).

Commercial Museum to Benjamin Franklin Hotel—Board bus marked Route D (east bound) at Chestnut and Thirty-Fourth Streets (6) and get off at Sansom and Ninth Streets (2).

Bus fare is 10 cents, pay as you enter on east bound busses and as you leave on west bound busses. Busses carry only as many passengers as there are seats.

TAXIS

Yellow cabs and Quaker (green) cabs are operated by the Mitten Management which operates the car and bus lines.

Fare on these cabs is 40 cents for the first mile and 30 cents for each additional mile. The fare between the Museum and the Benjamin Franklin Hotel ranges from 70 cents as a minimum to one dollar as a maximum.

SUBWAY—SURFACE LINES

Subway surface lines are not as convenient as the surface lines for travel between the Benjamin Franklin Hotel and the Commercial Museum. However, subway surface cars are convenient for those traveling from the Broad Street Station of the Pennsylvania Railroad to the Museum or return.

Use routes 11, 34 or 37 and get off the train at Woodland and Walnut Streets (5) when going to the museum. Board trains at the same point for return. The fare is the same as the surface cars, 8 cents. In these trains the fare is paid downtown; that is, when entering the subway going to the museum and when leaving the subway when returning from the museum to the station.

First International Heating
DIRECTORY

508 Aerologist Publishing Co., Chicago, Ill.
509 The Aerologist.

603 Air Reduction Sales Co., New York.
604

721 Airite Corp., New York.
Airite humidifiers. William Felderman, director of sales, S. C. Cutler, eng.

519 Airmaster Corp., Chicago, Ill.
Airmaster propeller and exhaust fans. W. A. Fox, pres., H. C. Hueglin, v.p., E. N. Anderson, sec.-treas., G. B. Tupper, sales and adv. mgr.

856 Air-Way Electric Appliance Corp., Toledo,
857 Ohio.
Air-Way unit heaters, Aeriet heaters and electric heaters. W. L. Mack, sales Mgr., E. J. Vermere, chief eng.

701 Alexander Bros., Inc., Philadelphia, Pa.
Tentacular transmission belts, showing adaptability to short-center drives. J. Allen Machin, sales mgr., George L. Abbott, adv. mgr. J. L. de Rabot, consulting eng. in charge of booth, assisted by J. M. Fisler and Frank Barmes.

519 Allen Air-Turbine Ventilator Co., Detroit, Mich.
Automatic ventilators.
C. K. Larned, pres., L. P. Halleck, v.p. and sales. Champion Sales Company's representatives, Frederick G. Volz, pres., E. M. Volz, treas.

5 American Brass Co., Waterbury, Conn.
6 Everdur metal, Anaconda brass pipe, copper tubes and sheet copper. W. H. Dowd, exhibit mgr., W. J. MacLean, J. A. Larmett, J. E. Becht, C. Seeley, E. Lang, F. Marrat, A. L. O'Brien, A. Boardman, E. Phelan.

942 American District Steam Co., No. Tona-
943 wanda, N. Y.
District steam heating equipment. Walter A. Schulmeister, mgr. Philadelphia district, B. M. Conaty, sales eng., R. C. Holley, sales eng.

158 American Gas Association, New York.
159
200
201

100 American Gas Products Corp., New York.
101 Ideal gas boilers, A.G.P. gas-fired steam radiators, room unit heaters (gas). H. L. Whitelaw, v.p., H. H. Dugdale, sales mgr., William V. Garrison, Jr., chief eng., and D. H. Waddington.

450 American Metal Products Corp., St. Louis, Missouri.
Grilles and Inwal cabinets for concealed radiation, shields and enclosures. Sam Kauffman, pres., Building Equipment Co.'s representative, Philadelphia, and John B. Gaudin, New York.

212 American Oil Burner Association, New York.

351 American Radiator Co., New York.
to Red Flash gas and magazine boilers, Corto
353 and Fantom radiators, Excelso and Hot
410 Coil water heaters, Arcoblast heaters,
to Arco metal pipe, etc. Theodore Ahrens,
412 pres., Charles H. Hodges, v.p., Donald M. Forgan, treas., Rolland J. Hamilton, sec., Martin J. Beirn, sales mgr., James P. Moonan, adv. mgr., Paul E. Baugh and Foster B. Rhodes.

7 American Society of Heating and Venti-
8 lating Engineers, New York.
(See also Research Laboratory).

507 American Temperature Indicating Co., Toledo, O.
Caliscope remote temperature indicators.

507 American Warming & Ventilating Co., Elmira, N. Y.
Direct-fired warm-air heating systems. Bert C. Davis, pres. and treas., Arthur A. Lewis, v.p., G. Raymond McGlenn, sec., Edwin Davenport, sales mgr.

357 Ames Iron Works, Div. of Pierce, Butler & Pierce Mfg. Co., Oswego, N. Y.
Majestic boiler. C. M. Clancy, special representative, C. N. Bowne, mgr. Philadelphia office, and Joseph C. Doyle, mgr., boiler sales.

362 Ames Pump Co., Inc., New York.
363 Ames vacuum heating pumps. Charles F.
400 Ames, v.p., A. H. E. Berchem, sec., R. H.
401 Frederick, chief eng. Dravo Doyle Co.'s representative.

954 Anthracite Coal Service, Philadelphia, Pa.
Coal and miniature coal-burning equipment and educational motion pictures. Service eng.

705 Armstrong Machine Works, Three Rivers, Michigan.
Glass model of Armstrong trap working under 5 lbs. steam pressure, showing how trap removes air and dirt, as well as condensate. T. H. Rea, sales mgr., O. E. Ulrich, adv. mgr.

249 Austin Heat Transference Corp., Port Iowa.

250 Chester, New York.
Austin rapid heat generator and Kelly safety boiler control. I. M. Austin, Sr., pres., P. H. Davis, v.p., F. D. Austin, treas., G. A. Daly, sec., and H. J. Oaar, P. A. Davis and H. Morrell.

448 Auto-Coala Corp., New York.

115 Automatic Burner Corp., Chicago, Ill.
116 ABC oil burner products. J. H. Hirsch, pres., O. C. Schroeder, v.p., E. A. Weil, treas., M. M. Hirsch, sales mgr., and E. H. Haupt, adv. mgr.

1021 Automatic Electric Steam Corp., New York.

124 Arthur H. Ballard, Inc., Boston, Mass.
Quiet Ballard burner in actual operation. A. H. Ballard, pres., James J. Kelley, v.p., W. A. P. Henninger.

502 Barnes & Jones, Jamaica Plain, Boston,
503 Mass.
Barnes & Jones vacuum and vapor steam specialties. Edwin Elliott and William T. Jones.

648 Beckwith Co., Dowagiac, Mich.
Beckwith warm-air heating systems. E. J. Clynch, sales mgr.

653 Bishop & Babcock Sales Co., Cleveland, O.

710 Massachusetts unit heaters and fans,
711 Bishop & Babcock vapor, vacuum and steam specialties and automatic temperature control, Reznor gas-fired unit heaters. F. N. Mizer, plants mgr., H. O. Strand, asst. supt., J. C. Thompson, sales mgr. and S. R. McDevitt and J. H. T. Anderson of Philadelphia, George F. Kline and C. E. Lawrence of New York and Marion I. Levy, research eng.

260 B-Line Boiler Co., Cleveland, O.
Automatic gas-fired boilers for steam, vapor and water heating. R. A. Bishop, pres., L. E. Bovee, v.p. and sales mgr., H. L. Schneider, sec., C. K. Gummerson, adv. mgr. and H. E. Lynch, eastern dist. mgr.

810 Bristol Co., Waterbury, Conn.
811 Indicating and recording instruments and humidity recorders. W. H. Bristol, pres., H. H. Bristol, v.p., Harris Whittemore, treas., S. R. Bristol, sec., H. L. Griggs, sales mgr., and J. B. Kelsey, adv. mgr.

342 Brown Instrument Co., Philadelphia, Pa.
343 Indicating and recording instruments. R. P. Brown, pres., C. H. Kerr, v.p., G. W. W. Cornman, treas., J. P. Goheen, sec., G. W. Keller, v.p. and gen'l sales mgr., H. W. Dearing, adv. mgr., and R. B. McCafferty, E. J. Cushing, R. R. West, S. W. Prince, J. H. O'Brien, C. E. Sharp, A. O. Pearson, W. S. Mueller, J. A. Robinson and E. H. Owens.

1053 Brownell Co., Dayton, O.
1054 Brownell welded steel boiler with stoker in operation, also residence-size welded steel boiler. H. E. Seabold, sales mgr.

620 Bryan Steam Corp., Peru, Ind.
621 Bryan gas-fired boiler in operation, also Bryan oil-fired boiler. George A. Bryan, pres., George T. Wright, sales and adv. mgr., Erwin Kramer, Philadelphia branch mgr.

208 Bryant Heater & Mfg. Co., Cleveland, O.
209 Bryant gas boilers. G. D. Yeaton, J. M. Johnson, V. H. Metz, O. L. Williams and T. D. Boyles.

357 Builders Iron Foundry, Providence, R. I.
Shunt steam meters, Type KS and Orifio meters, Typ GK. D. K. Bartlett, v.p., A. M. Hammond, adv. mgr., and A. A. Wood and W. S. Codell of Philadelphia.

450 Building Equipment Co., Inc., Philadelphia, Pa.
Kauffman radiator shields and enclosures. Sam Kauffman, pres., Sidney Lichentestein, v.p., Samuel S. Fryman, v.p.

445 Burnham Boiler Corp., Irvington, N. Y...
Burnham boilers. Clifford E. Dobbs, A. H. MacDade, E. L. Sawyer, G. Frank Bacon, Charles W. Lowry and John J. Michel.

1 to 4 Carrier Engineering Corp., Newark, N. J.
Carrier air-conditioning equipment. W. H. Carrier, pres., E. T. Murphy, v.p. and sales mgr., J. I. Lyle, treas., L. L. Lewis, sec., D. C. Lindsay, adv. mgr. Brewster Beach, Carrier-Lyle Corp., Fred J. Wilson, Philadelphia office of Carrier-Lyle Corp., Herman Jackes, Aerofin Corp., P. L. Davidson, Philadelphia office, Carrier Engr. Corp.

558 W. D. Cashin Co., Boston, Mass.

451 Celotex Co., Chicago, Ill.
452 Celotex building insulation. B. G. Dahlberg, pres., C. E. Stedman, v.p. and gen'l sales mgr., C. G. Rhodes, treas., E. B. Roberts, sec., J. J. Rosenfels, adv. director.

Central Radiator Co. (see Molby Boiler Co.)

346 Century Electric Co., St. Louis, Mo.
Century electric motors and fans. G. H. Pechin, W. J. Nace and L. H. Downing.

140 Century Engineering Corp., Cedar Rapids,
Century fuel Oil Burners. E. J. Lattner, pres., M. D. McWilliams, v.p., and adv. mgr., J. A. Lattner, treas. and sec.

655 Chicago Pump Co., Chicago, Ill.
656 "Condor-Vac" vacuum pumps, condensa-
657 tion and horizontal pumps and "Flush-Kleen" sewage ejector. M. I. Weil, pres., G. F. Mannion, national sales mgr. and Culbert Whitby, Philadelphia, George Thom and W. Kreuger.

1055 W. L. Clayton, Inc., Jersey City, N. J.
1056 "Dioxon" buckwheat coal burner, grate bars, heat control and automatic stoker. W. L. Clayton, pres., E. L. Petrick, sales mgr., Philip Hogan, W. Alexander, J. Butch and E. A. Hayes.

154 Clow Gasteam Heating Co., Philadelphia, Pa.
Clow Gasteam heating systems. W. W. Penn, v.p., and G. A. Post and G. R. Miller.

341 Cochrane Corp., Philadelphia, Pa.
422 Deaerating hot water generator, steam and oil separators, back-pressure and boiler blow-off valve, traps and drainers. J. S. L. Wharton, pres., H. E. Gibson, v.p. and sales mgr., J. C. Jones, treas., A. B. Wallem, sec., George H. Gibson, adv. mgr. Wilbur Sailer, Austin Dresher, R. D. B. Wright, Fred Sage and William C. Montalvo.

104 Columbia Burner Co., Toledo, O.
Columbia conversion gas burners for domestic use. H. J. Mandel, gen'l mgr., M. M. Wallace, ass't sales mgr.

312 Combination Boiler Co., Benton Harbor, Mich.
Combination triple service boiler; welded steel water tube boiler, especially built for automatic heat with oil, gas or stoker. H. C. Baster, v.p. and genl. mgr., Spencer A. Merrell, sales mgr., and Henry S. Downes, ass't sales mgr.

1046 Combustion Specialties Corp., New York.
1047

321 Cook Electric Co., Chicago, Ill.
Automatic fuel-oil pumps (electric), electric valves, controllers for oil burners, metal bellows, anti-syphon valves and fuel-oil gauges. G. R. Folds, pres. and sales mgr., L. Keith, v.p., A. D. Edwards, treas. and sec., J. F. Jaap, adv. mgr. A. M. Wilkins, E. D. Swanberg and D. C. McKee.

462 Cooling and Air Conditioning Corp., New
463 York.

421 Copper Radiator Sales Corp., Schenectady, N. Y.

506 Coppus Engineering Corp., Worcester, Mass.
Coppus cooling fans, forced draft fans, steam turbine driven unit heater and steam turbine. Edwin-Elliot & Co., representative, Philadelphia.

1045 Counties Equipment Co., Inc., Philadelphia, Pa.
Therm-O-Vent automatic coal combustion unit, anthracite coal stoker. James C. Sulger, pres., Elmer Mengis, v.p., Harry A. Prock, treas., sec. and sales mgr.

and Ventilating Exposition of EXHIBITS

550 Abram Cox Stove Co., Philadelphia, Pa.
Novelty square and round heating boilers and hot water supply boilers. Abram C. Mott, Jr., pres., Walter G. Thompson, sales mgr.

404 Crane Co., Chicago, Ill.
to Radiators, valves, fittings, specialties, gas-
407 fired boiler and industrial water softener. M. Baxter, Jr., in charge of exhibit.

122 Crystal Oil Burner Corp., New York.
Crystal oil burners. F. W. Hohensee, pres., J. P. McCarthy, v.p., A. J. Themack, treas., K. E. Hohensee, sec., K. A. Brahe and John Brown.

109 Direct Control Valve Co., Chicago, Ill.
110 Direct Control valve in operation on radiator and installation photographs. C. E. Pynchon, pres., E. M. Field, Jr., v.p., J. M. Lyons and J. G. Lawler, New York office, H. C. Wyatt, western sales mgr., F. O. Rollins, Washington office, H. P. Palmer, Philadelphia office.

1057 Domestic Stoker Co., New York.
1058 The Electric Furnace-Man, an automatic coal burner. Oscar F. Ostby, v.p.

546 Draft-A-Justor Corp., Chicago, Ill.
Draft-A-Justor draft regulators. M. R. Schoenfeld, gen'l mgr.

554 C. A. Dunham Co., Chicago, Ill.
555 Operating units, Dunham differential vacu-
608 um system, control board, signal board
609 and control valve. C. A. Dunham, pres. and treas., F. E. Schmidt, v.p., C. M. Brigham, sales mgr., and Oliver J. Prentice, adv. mgr.

418 Struthers Dunn, Inc., Philadelphia, Pa.
Temperature control equipment, relays, thermostats, electrically heated pots and pouring ladles, fish spine beads. J. Struthers Dunn, pres., William L. Kennedy, v.p., Alex. J. Airston, treas., J. F. McAllister, sec., Norman McKinney, sales mgr., and E. T. Harvey and Charles F. Schattler.

257 Duo-Tor Mfg. Co., Dayton, O.
Automatic incinerator and water heater combined. W. C. Epstein, v.p. and Charles N. Winter, Lewis & Co., Philadelphia.

402 Durston Gear Corp., Syracuse, N. Y.

137 Economy Oil Burner Co., Harrisburg, Pa.

854 Economy Pumping Machinery Co., Chica-
855 go, Ill.
High and low-pressure centrifugal pumps and non-clogging sewage pumps. 1¼-in. high-pressure pump in operation. Models with open covers for inspection of working parts. Non-clogging pumps for sewage pumping stations. R. H. Thomas, pres., L. G. L. Thomas, v.p., W. W. Huggins, sec., and H. R. Ryan, T. J. Rowland, E. S. Quackenbush and J. A. Conlogue, New York, G. R. Chambers, Philadelphia, and W. I. Collier, Baltimore.

859 The Ediplate Corp., Orange, N. J.

112 Electrol, Inc., New York.
Model TU Electrol oil burner, new model A burner for small homes. L. E. Saxby, eng.

502 Edwin Elliott & Co., Philadelphia, Pa.
to Barnes & Jones vapor heating specialties,
506 Wright-Austin high and low-pressure steam traps, steam and oil separators, exhaust heads and specialties, Leslie pressure regulators, pump governors and strainers and Coppus blowers, exhausters, turbines, etc.

902 Emerson Electric Mfg. Co., St. Louis, Mo.
Emerson unit heater and capacitor motors, exhaust and furnace fans. W. R. Fraser, mgr. motor sales, T. J. Eagan, Chicago office, H. J. Binder, New York office and J. A. Rodgers, chief eng.

607 Engineering Publications, Inc., Chicago.
Domestic Engineering.

559 Engineering Publications, Inc., Chicago, Ill.
Heating, Piping and Air Conditioning.

408 EverHot Heater Co., Detroit, Mich.
EverHot and Par-X automatic water heaters. Thermal-art radiation. Frank W. Shuell, pres., E. E. Ledbetter, treas. and sales mgr., J. A. Appelhof, sec., Robert E. Thomas, adv. mgr., also W. I. Vallett, E. S. Thompson, C. F. Thompson, EverHot Heater Sales Co.

319 Fitzgibbons Boiler Co., Inc., New York.
320
G. E. Olsen, mgr. of sales, Paul K. Addams.

702 Stanley G. Flagg & Co., Philadelphia, Pa.
703

146 Fluid Heat, Inc., Baltimore, Md.
Domestic oil burners. H. S. Frasher, pres., W. R. Jones, divisional sales mgr., T. H. Smoot, chief eng.

123 Fowler Oil Burner Co., Worcester, Mass.
Fowler range burners, stove heaters and automatic oil burners. John H. Ruth, v.p., George O. Brumm, Ralph Eccleston.

549 Foxboro Co., Foxboro, Mass.
Foxboro relative humidity controller. Foxboro steam flow meter and Foxboro humidity recorder - controller. W. W. Patrick, v.p., Joseph Esherick, Allen Auchterlonie, J. O. Tragard.

700 O. E. Frank Heater & Engineering Co., Inc., Buffalo, N. Y.
Water heaters for industrial plants. Mrs. Olive E. Frank, pres., F. A. Hodge, Jr., ass't treas.

313 Fuel Oil & Temperature Journal, New York.
314 "Fuel Oil and Temperature Journal."

302 Fulton Sylphon Co., Knoxville, Tenn.
Sylphon heating specialties. W. M. Fulton, pres., A. W. King, v.p., C. N. Mynderse, treas., J. V. Giesler, sec., G. M. Ellis, sales mgr., E. D. Rogers, adv. mgr. Sheffler-Gross Co.'s representative, Philadelphia.

544 General Electric Co., Schenectady, N. Y.
545 Motors and controls.
618
619

206 General Gas Light Co., Kalamazoo, Mich.
207 Humphrey industrial unit heater.

106 General Iron Works Co., Cincinnati, O.
"Hot-Kold" gas-fired system of heating. Everett S. Buck, con. eng. Bear Engineering Company's representatives: Walter H. Fasshauer, pres., Herbert K. Bear, v.p., S. Parker Chase, sales mgr.

645 Germer Stove Co., Erie, Pa.

213 Grant Oil Burner Corp., New York.
Working model of oil burner. Frank Fischer, pres., A. F. Van Pelt, v.p. and sales mgr., A. F. Van Pelt, treas., H. L. Wolf, sec. and gen. mgr., L. J. Spingler, district sales mgr., Herman Otto Klug, sales eng., G. Sivertsen, eng., and J. Falvey, J. McCuen, Freedman, Martin A. Roddy, W. J. Schmitt, N. Norin, W. L. Willis and H. S. May.

557 Grinnell Co., Inc., Providence, R. I.
558 Thermolier unit heaters, Thermoflex steam
605 traps, adjustable pipe hangers and sup-
606 ports, Equiflo valves. L. B. Higgins, sales eng., Philadelphia, E. J. Morris, sales eng., New York, A. E. Martin, Providence, J. D. Harrington, Boston, Howard E. Branch and A. W. Moulder, Providence.

1050 William S. Haines & Co., Philadelphia, Pa.
1051 Thermostatic traps for vapor, vacuum and pressure service. G. A. Seiffert, pres., Horace A. Burke, treas., James H. Davis, Charles H. Mahler, Henry M. Drager and John D. Bresnihan.

149 Hardinge Bros., Inc., Chicago, Ill.
Hardinge fuel-oil burners in operation. W. A. Kemp, sales mgr., Henry C. Sharp, director of engr., D. B. Tuxhorn.

602 Hart & Crouse Co., Utica, N. Y.
Hart & Crouse Red Blast boiler, Royal garage heater. J. J. Lally, sales mgr., W. G. Culbert, Philadelphia mgr., William P. Culbert, S. S. Whitby, T. S. Thiabult, E. B. Beans, G. E. Horan.

759 Hart & Hutchinson Co., New Britain, Conn.
Steel showers and steel toilet partitions. Reuben C. Twichell, pres., Logan E. Page, v.p., William H. Hart, treas., Logan E. Page, sec., sales mgr. and adv. mgr., and William Hassenplug and Joseph Duffy.

511 Hartzell Propeller Fan Co., Piqua, O.
512 Charaway ventilating equipment and propeller fans. Gilbert S. Farier, C. V. Vibber.

119 Heating Journals, Inc., New York.
Oil Heat.
P. E. Fansler, editor, A. E. Coburn, associate editor, Alfred H. Noyes, business mgr., and F. M. Sloan, western mgr.

9 Heating and Ventilating. 521 Fifth Ave.,
10 New York.
Heating and Ventilating. A. S. Armagnac, editor, Clifford Strock, associate editor, Cliff W. Presdee, adv. mgr., Gustave Petersen, special representative, William F. Steeg, western mgr.

542 Heggie-Simplex Boiler Co., Joliet, Ill.
543 Heggie-Simplex jacketed steel and smokeless boilers.

741 Heilman Boiler Works, Allentown, Pa.

322 Heintz Mfg. Co., Philadelphia, Pa.
"Fin-type" cabinet radiators. A. L. Lambert, treas., W. Demaris, sec., J. R. Musson, sales mgr., W. H. Douglas, adv. mgr.

245 Herr & Co., Lancaster, Pa.
Herco automatic oil burner. A. H. Herr, pres., F. E. Herr, treas., Fred A. Faux, sales.

508 E. Vernon Hill Co., Chicago, Ill.
Pitot tubes and gauges, filter gauges, carbon-dioxide test set, anemometers, dust counters, instruments for determining humidity, thermometers. E. V. Hill, pres., P. J. Marshall, sec., E. B. Stark, adv. mgr.

513 W. F. Hirschmann Co., Inc., Chicago, Ill.
514 W. F. Hirschmann, pres., Walter Flemming, mgr., New York; Kenneth Pohle, mgr., Boston; Warren Guniord, eng.

906 Hoffman Specialty Co., Inc., Waterbury,
to **Conn.**
909 Venting valves, "Controlled Heat" equipment, Economy pumps, Moto-meters and Thermador electric heaters. George D. Hoffman, pres., Charles V. Haynes, v.p., and sales mgr., H. W. Adams, Jr., treas., W. K. Simpson, sec.

15 Illinois Engineering Co., Chicago, Ill.
16 Illinois vapor, vacuum and zone control heating system specialties. Robert L. Gifford, pres., James C. Matchett, v.p., J. L. Ehretsman, sales mgr. A. F. Nesbet, Chicago, Phil E. Wood, Philadelphia, and A. L. Browne, New York.

453 International Boiler Works Co., East Stroudsburg, Pa.
International Triple - Service boilers. Charles S. Hebard, pres., Frank B. Metcalf, v.p., sales mgr. and adv. mgr., Charles R. Turn, treas., M. C. Easton, sec. James A. Condon, Inc., of Philadelphia.

117 International Burners Corp., New York.
Caloroil, Crescent and Victory oil burners. George Bullock, pres., M. J. Binkley, v.p., H. C. Alexander, treas., J. H. Hassinger, sales mgr., D. E. Reisig, G. H. Percival and H. White.

310 International Heating Co., St. Louis, Mo.
Oil burners and heating equipment. Guy A. Reeves, sales mgr.

309 Iona Ventilator Co., Inc., Philadelphia, Pa.
Automatic ventilation equipment. W. H. Jardine, treas. and sec.

242 Janette Mfg. Co., Chicago, Ill.
Hydrolator, automatic oil pumps, motorized blowers. J. T. Janette, pres. and treas., J. I. Janette, v.p., A. E. Klunder, sec. and sales mgr., C. E. Case, adv. mgr., Rex Jerris.

17 Johnson Service Co., Milwaukee, Wis.
18

252 S. T. Johnson Co., Oakland, Calif.

253 Oil burners.

127 Jones Hollow Ware Co., Baltimore, Md.
Domestic heating boiler, steam type, with oil burner in operation. John Horner, pres., J. B. Bernhard, v.p., G. B. Collins, treas.

308 Keasbey & Mattison Co., Philadelphia, Pa.
K&M Featherweight 85% pipe and boiler covering, high temperature pipe and boiler covering, air cell pipe covering, and packings. Henry F. Miller, Philadelphia mgr., and J. D. Marine, A. E. Whitfield, W. L. Peebles, E. M. Hewish, L. C. Bell and W. J. Deckman.

551 Kelly Brass Works, Chicago, Ill.
Kelly non-adjustable automatic steam, air and vacuum valves. F. W. Leuthesser, S. pres. and sec., E. G. Leuthesser, v.p., C. V. Stubbs, ass't sales mgr.

750 Kelsey Heating Co., Syracuse, N. Y.
Kelsey-Bradley Conditionaire warm-air generator. R. H. Bradley, H. W. Bradley, E. J. Dwyer, R. J. Smith and J. S. Makin.

413 Kewanee Boiler Corp., Kewanee, Ill.
414 Kewanee up-draft firebox and Type C smokeless welded boilers, Tabasco heater and Kewanee slim-type radiators. Arthur Hare.

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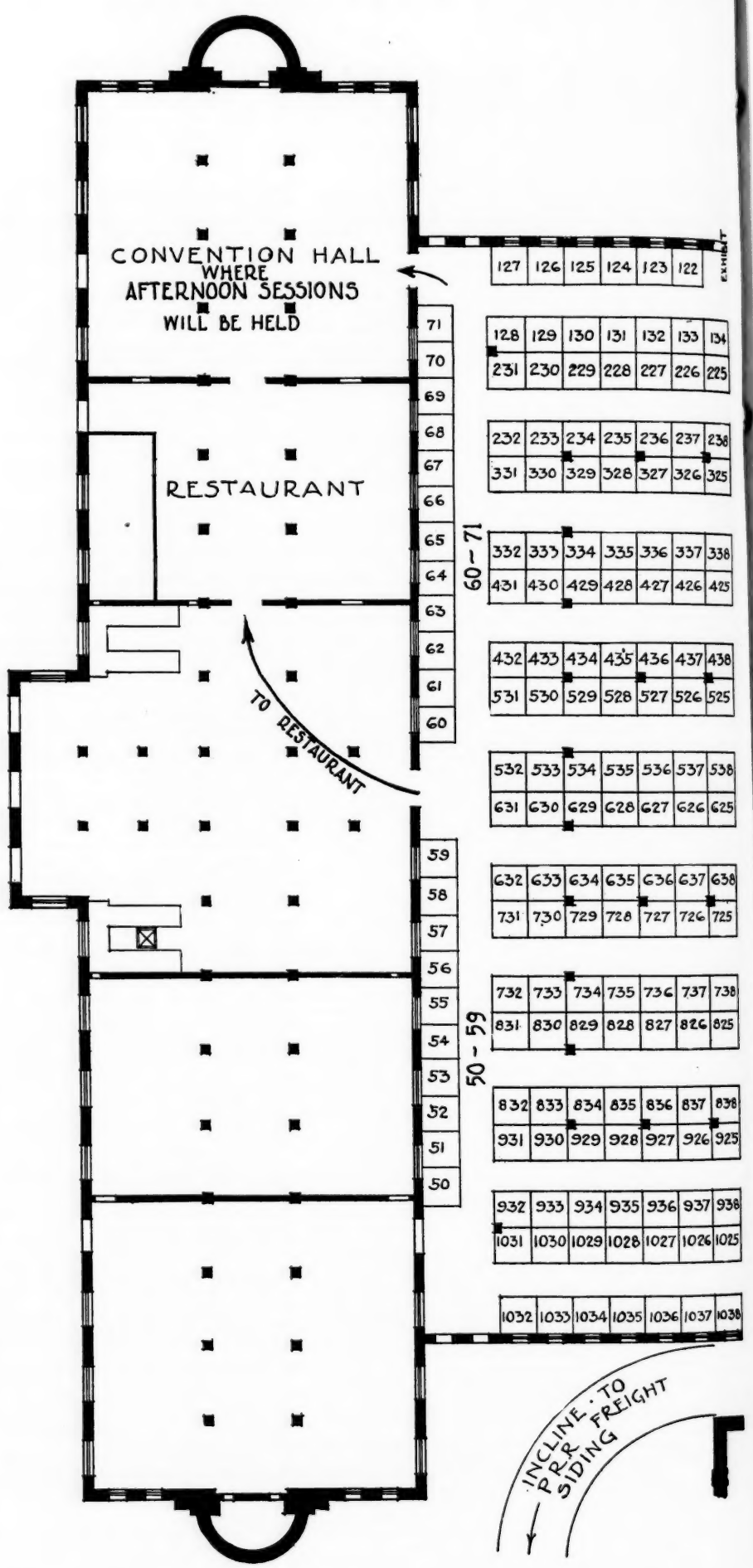
GUIDE
to
EXHIBITS

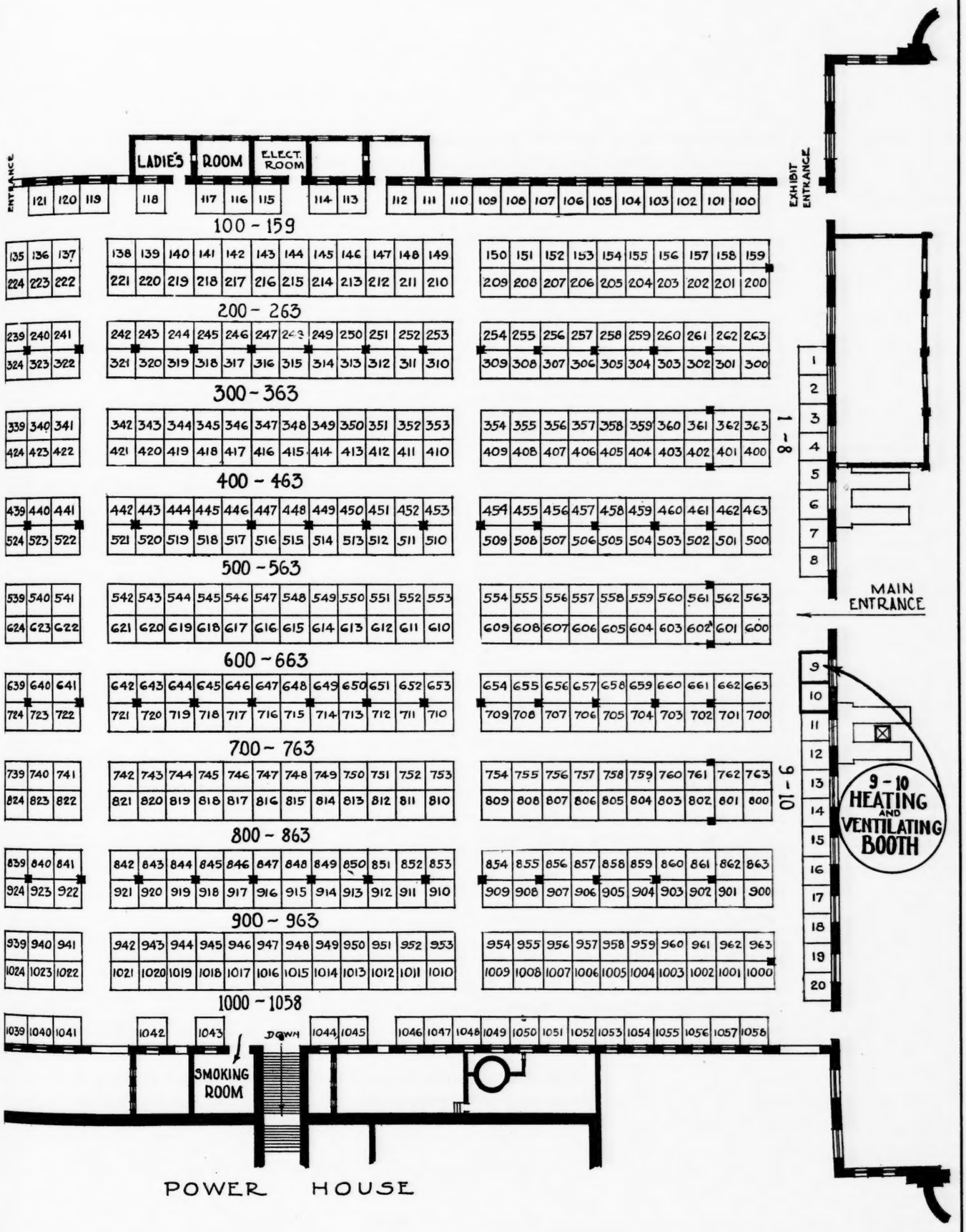
First International Heating and Ventilating Exposition

▼

Philadelphia Pa.

January 27-31 1930

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POWER HOUSE

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243 Kewanee Boiler Co., Inc., New York.
244 Kewanee boilers. John A. Darts, v.p., in charge of sales, Raymond Newcomb, ass't mgr. of sales, E. N. Black, 3rd, mgr., Philadelphia office, Fred Harmer, Phila. office, and R. L. Merritt, mgr., Washington office.

962 Kieley & Mueller, Inc., New York.
Kieley pressure-reducing valves, steam traps, water feeders, etc. Joseph O'Connor, v.p., C. H. Dutcher, sales mgr.

963 Korfund Co., Inc., New York.
Korfund natural cork pads and Vibrodampers and Troy steam engine. S. Rosenzweig, pres., H. B. Villiers, sales mgr.

652 Langenberg Mfg. Co., St. Louis, Mo.
Front Rank air-conditioning heating systems. George F. Langenberg, pres., E. B. Langenberg, v. p., George L. Kleeber, treas., J. J. Walsh, sec., A. L. Walters, chief engineer.

1052 Leader Boiler & Heater Co., Chicago, Ill.
Leader Koolstack automatic heating machine. L. M. O'Neill, v.p., John Park, Jr., Joseph Young, Mead Burbrow.

654 Leeds & Northrup Co., Philadelphia, Pa.
Recording potentiometer pyrometers for indicating and controlling temperature. Henry Brewer, sales mgr., L. R. Garretson, adv. mgr., E. B. Estabrook, Oscar Brewer, D. F. McConnell, Jr.

741 Lehigh Fan & Blower Co., Allentown, Pa.
Lehigh ventilating fans and blowers. Lloyd J. Hersh, mgr.

505 Leslie Co., Lyndhurst, N. J.
Temperature, pressure and pump regulators, reducing and relief valves and self-cleaning strainers. S. I. Leslie, pres., J. J. Cizek, v.p., J. M. Naab, treas.-sec., F. J. Thrush, J. A. DeLong, R. Courter, F. D. Riggio.

257 Lewis & Co., Philadelphia, Pa.

612 Linde Air Products Co., New York.

613 Welding demonstration.

304 Liquidometer Corp., Long Island City, New York.
Liquidometer tank gauges. S. N. Couch, adv. mgr. A. J. White, dist. representative, T. J. Kenney, distributor Sheffler-Gross and W. O. Beh, mgr. Industrial div.

356 McCord Radiator and Mfg. Co., Detroit, Michigan.
McCord radiators. A. C. McCord, pres., C. R. Hammer, v.p., L. Hamlin, sec., P. L. Barter, sales mgr., E. O. Bodkin, adv. mgr.

1002 McDermott Water Heaters, Inc., New York.
McDermott water heaters. C. C. McDermott, pres., M. E. VanVliet, representative.

706 McDonnell & Miller, Chicago, Ill.
Rotary valve duplex boiler feeder and safety feeder. E. N. McDonnell, pres., W. A. Murphy, eastern sales mgr., and R. E. Jones and Merrill F. Blankin, Philadelphia.

120 McIlvaine Burner Corp., Evanston, Ill.
212 McIlvaine oil-burning equipment. John H. McIlvaine, pres., F. W. Gatter, v.p., J. A. Adamson, sales mgr., N. H. Rand.

458 McQuay Radiator Corp., Chicago, Ill.
459 McQuay unit heaters, concealed and cabinet heaters. M. F. May, sales mgr., J. D. Gaynsworth, chief eng., E. Sielert, plant eng. McQuay Radiator Corp., New York and Comet Radiator Co., Philadelphia, representatives.

315 Marr Oil Heat Machine Corp., Minneapolis,
316 Minn.
Marr oil-heat machines, models E, EC, and H. Earl Marr, pres., Edward R. Butler, Edward G. Knox, E. I. Lassor and M. W. Bowen.

144 Mayflower Oil Burner Corp., West New York, N. J.

560 James P. Marsh & Co., Chicago, Ill.
561 Marsh heating specialties. O. W. Thompson, pres., A. D. Rose, sales mgr.

113 May Oil Burner Corp., Baltimore, Md.
114 Quiet May automatic oil burners. E. M. Fleischmann, pres., A. J. Fleischmann, treas., A. K. Lotzman, Jr., sec., E. S. Jeffries, ass't to pres., H. Gillis, adv. mgr.

202 Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Gas-fired boilers and electric pumping outfits. F. K. Mears, pres. and treas., E. W. Mears, sec., and adv. mgr., H. H. Etter, sales engr.

541 The Mercoid Corp., Chicago, Ill.
622

644 Meyer Furnace Co., Peoria, Ill.
Weir (steel) warm-air furnace. Frank E. Mehrings, mgr., James F. Flavelle, traveling heating engr.

1009 Midwest Mfg. Co., Bradford, Pa.
Automatic and unit air filters and humidifiers. John Hellstrom, E. Ohnell, Jr., sales mgr., P. L. Pryibil, C. Bowen.

221 Milwaukee Air Power Pump Co., Milwaukee, Wisconsin.
Combustion oil burners, domestic and industrial. Julius P. Heil, pres., H. S. Rogers, v.p., Joseph F. Heil, treas., F. W. Reichert, sec., H. Pugh, adv. mgr.

454 Minneapolis - Honeywell Regulator Co., 455 Minneapolis, Minn.
Unit heater and sectional control systems, motorized valves, relays, oil-burner and stoker controls. M. C. Honeywell, pres., C. B. Sweatt, sales mgr., George D. Kingsland, Ralph Goetzenberger, A. H. Lockrae.

842 Mineral Felt Insulating Co., Toledo, O.
Mineral Felt insulating products. Frank G. Russell, pres. and sales mgr., John B. Russell, v.p., Ralph S. Phillips, treas. and sec., Robert G. Ewell, adv. mgr.

910 Modine Mfg. Co., Racine, Wis.
911 Modine industrial and domestic heating equipment in operation. M. S. Potter, gen. mgr., William J. Burke, sales mgr., O. E. Desmond, adv. mgr.

863 Molby Boiler Co., and Central Radiator
900 Co., New York.
Molby magazine-feed boiler, Lansdale-Craig water-tube boiler, Gray Sentry jacketed square boiler, Lansdale round boiler and Lansdale radiators. L. B. Ladoux, pres., F. M. Brooks, v.p. and sales mgr., Charles Gurenson, treas., Henry Hoeltge, adv. mgr.

762 Monarch Metal Weatherstrip Co., St. Louis, Missouri.
Monarch metal weatherstrips. A. M. Lane, pres., W. L. Zoellner, sales mgr., Willard D. Smith, director of sales.

210 Motor Wheel Corp., Lansing, Mich.
211 Four units consisting of one furnace; four space heaters. H. I. Piatt, sales mgr.

1048 Motorstokor Corp., New York.
1049 W. L. Higgins, v.p., Frank H. Rowe, sales mgr.

105 L. J. Mueller Furnace Co., Milwaukee, Wis.
Gas-Era gas-fired furnaces and boilers, H. P. Mueller, v.p. and director of sales, C. L. Hewitt, Jr., Baltimore branch mgr., E. A. Jones, Engr. gas div.

661 Multicell Radiator Corp., Buffalo, N. Y.
Multicell unit heaters and copper radiation. W. G. Fraser, pres., H. F. Hutzel, plant mgr., G. W. Gerstung, eng.

500 Nash Engineering Co., So. Norwalk, Conn.
501 Jennings vacuum heating and sump pumps.
562 I. C. Jennings, pres., D. E. Nash, v.p.,
563 H. L. Nash, treas. and sec., A. D. Harvey,
600 sales mgr., G. B. Wright, adv. mgr. and
601 L. Burroughs, Philadelphia.

956 National Air Filter Co., Louisville, Ky.
Two pass (oil type) air filter, Airmat (dry type) air filter, and Airmat (dry type) dust arrester. J. L. Harpham, pres. and sales and adv. mgr., S. Parker Chase, Philadelphia representative, and W. C. Kruse, New York representative.

111 National Airoil Burner Co., Philadelphia, Pa.

254 National Radiator Corp., New York.
255
256

753 National Regulator Co., Chicago, Ill.

1000 O. E. Specialty Co., Milwaukee, Wis.
1001

647 National Warm Air Heating Association, Columbus, Ohio.
Printed matter on research activities, etc. Jack Stowell.

11 John J. Nesbitt, Inc., Philadelphia, Pa.
and Universal heating and ventilating units.
12 Albert J. Nesbitt, treas. and sec., Harry M. Goldberg, sales mgr. and adv. mgr.

641 Newport Boiler Co., Chicago, Ill.
Newport magazine-feed boiler. L. Halliday, v.p., A. H. Fidler, local mgr., George J. Seipp.

355 Orr & Sembower, Inc., Reading, Pa.
Knowlton Watertoob steel heating boiler. Harry J. Stiteler, treas., G. K. Sembower, sec., Lewis J. Truhan, H. G. Reifsnyder, G. H. Brobst.

921 Parks-Cramer Co., Fitchburg, Mass.
Devices for air conditioning and humidity regulation. R. E. Dorr, ass't adv. mgr., Thayer Francis, L. F. Ross, sales eng.

707 Peerless Unit Ventilation Co., Inc.,
708 Bridgeport, Conn.
PeerVent units for heating and ventilating. M. J. Callahan, pres., A. V. Dearden, sec., A. M. Farrier, sales mgr., W. R. Sutcliff, A. C. Lehman, H. A. Preston, F. P. Gilmore.

944 Henry Pels & Co., Inc., New York.
945 Pels combination punch, plate shear,
1018 angle, bar and tee cutter, and built-in
1019 notcher or coper in operation. Pels 220-ton open gap press. C. L. Martin, v.p., G. W. Thorbahn, sec., T. F. Kane, E. E. Tailfer and J. A. Weigand, representatives.

548 Penn Electric Switch Co., Des Moines, Ia.
Penn automatic controls for oil burners, gas-fired burners, unit heaters, etc. Albert Penn, pres., Ralph Pen, v.p., treas. and sec., M. E. Henning, sales and adv. mgr., Glen Morris, Philadelphia.

259 Pennsylvania Furnace & Iron Co., Warren, Pennsylvania.
Pennsylvania gas furnace for house heating and Pennsylvania floor heater. H. A. Crary, pres., A. L. Schellhammer, v.p., R. L. Bodgett, treas., sec. and sales mgr.

205 Philadelphia Electric Co., Philadelphia, Pa.

153 Philadelphia Gas Works Co., Philadelphia, Pa.
H. S. Christman, ass't sales mgr., A. B. Eckert, N. S. MacFarlan, J. M. Hinds, J. S. Smith.

922 Phillips Drill Co., Chicago, Ill.
Spring hammers and self-drilling expansion shells. J. H. Phillips, pres., Leslie Phillips, sec., William W. Howe, sales mgr.

359 Pierce, Butler & Pierce Mfg. Corp., N. Y.
to Boilers and radiators. S. B. DeLong, pres.,
361 P. J. Faherty and Martin A. Rooney, v.p., L. Fest, Philadelphia sales mgr., E. T. McCormack, George Fox, R. C. Strong, H. D. Stewart, A. O. Christian, Paul Dewees, H. C. Cody, Jr., E. R. Bopp, E. J. Mummert, P. L. Leighton, W. N. Mollen, W. C. Seltzer and A. Kesler, office manager.

615 Piqua Electric Mfg. Co., Piqua, O.
616 Aerovent exhaust and ventilating fans. Martin W. Bauer, v.p. and sales mgr., Niels A. Lundgard, treas., and Winfield E. Benjamin and M. E. Burgett, Philadelphia.

203 Pittsburg Water Heater Co., Pittsburgh, Pennsylvania.
Gas-fired house heating boilers. H. G. Walker, pres., Bennett Walker, v.p., J. C. Baird, treas., James Ryan, sec., George Swaska, sales mgr., N. A. Capo, adv. mgr.

661 Power Efficiency Corp., Buffalo, N. Y.

961 Reed Air Filter Co., Louisville, Ky.
Air cleaning equipment. Howard C. Murphy, v.p., John R. McConnell, sales mgr., and Joseph Hucker, F. C. Clifford, and F. F. Espenschield.

222 Rawlplug Co., Inc., New York.
Rawlplugs, Rawldrills and Crowners. W. R. Howard, pres., M. L. Schulte, v.p., H. G. Jenton, exhibit mgr.

350 F. I. Raymond Co., Chicago, Ill.
Raymond Duo-stat for steam and hot water and Raymond gradual-acting motor-operated valves. F. I. Raymond, pres.

128 Research Laboratory, A.S.H.&V.E., Pittsburgh, Pa.
136 U. S. Bureau of Mines and U. S. Bureau of Standards exhibits.

642 Richardson & Boynton Co., New York.
643 Richardson & Boynton sectional boilers, round boilers, hot water supply boilers and warm-air heaters. L. W. Arny, adv. mgr., R. W. Barcus, mgr. of southeastern division.

262 Richmond Radiator Co., Inc., New York.
263 Richmond boilers and radiators. W. G. Langford, pres., A. H. Schroth, v.p., adv. mgr. and sales mgr., H. N. Kelley, treas. and sec., H. S. Minnich, A. A. Marks, C. L. Maxwell, W. D. Cook, R. B. S. Packer.

953 Ric-wiL Co., Cleveland, O.
Ric-wiL underground conduit systems for steam mains. J. A. Burrough, sales mgr., O. F. Bartlett, adv. mgr., L. T. Burrough, Carl Harrington.

704 H. H. Robertson Co., Pittsburgh, Pa.
Robertson stationary roof-type ventilator. H. H. Robertson, pres., W. S. Tallman, v.p., A. G. Spurlack, treas., J. S. Ervine, sales mgr., F. C. Russell, Pierre Blommers, F. C. Anderson, L. T. Michener, T. A. Moran, A. R. Gray.

1006 Rome Brass Radiator Co., New York.
to Robras under-the-window radiator with
1008 removable panel; Aulbras water heaters. J. S. Walsh, Philadelphia representative, E. C. Powers, J. C. Gentle, M. Withers, P. J. Grogan, all of Philadelphia; C. C. Hansen, L. M. Greff, J. A. Swan, W. F. Goodnow, and D. L. Mills, all of New York.

756 Rome-Turney Radiator Co., Rome, N. Y.
Rome helical fin-tube and blast heaters. W. L. Lynch, pres., H. J. Beasley, sales mgr., S. J. Fretz and Harry Klingler.

150 George D. Roper Corp., Rockford, Ill.
151 Roper gas-fired warm-air furnace. W. J. Foster, sales representative.

1021 Ross Safety Switch Co., New York.

157 Rudd Mfg. Co., Pittsburgh, Pa.
Rudd multi-coil storage water heaters, continuous flow water heaters, Ruud-Autohot storage water heaters. E. J. Horton, chief eng., C. E. Bartlett, D. A. Worrell, F. T. Snyder, C. A. Goodwin.

614 Rustless Iron Corp., of America, Philadelphia, Pa.

719 Sanitary and Heating Publishers Corp.,
720 New York.
Sanitary and Heating Age.

763 Sarco Co., Inc., New York.
800 Sarco radiator traps, packless supply valves, steam traps, self-cleaning straightway strainers, self-contained temperature regulators, air eliminators and boiler return traps. C. Wells, pres., E. J. Ritchie, sales mgr., F. C. Perkins and M. H. Landon, Philadelphia, and R. W. Cumming, New York.

442 Schade Valve Mfg. Co., Philadelphia, Pa.
Schade engineering specialties for control of fluids, vapors and gases. Albert Schade, Sr., pres., M. E. Schade, treas., Frank H. Jones, sec., C. P. Sanville, W. A. Kleschick, E. C. Deuter, A. Keppler.

354 Schutte & Koerting Co., Philadelphia, Pa.
Radiafin tubes for air heating and air cooling units, fuel-oil burners, boiler-feed injectors, Lovekin gas shut-off valves for domestic water heaters, stop check valves, water jet eductors, reducing valves and gear pumps. H. C. Woodward, adv. mgr., H. M. Kuppinger, J. J. Gessleman, A. R. Loescher and W. E. Murdock.

617 H. M. Sheer Co., Quincy, Ill.
Sheer Comfort heat regulators. J. R. Williams, pres., R. T. Williams, v.p., G. H. Williams, treas. R. B. McCarl and J. Preston Miller, Jr.

303 Sheffler-Gross Co., Inc., Philadelphia, Pa.
Representing Fulton-Sylphon Co., Fisher Governor Co., L. J. Wing Mfg. Co., Liquidometer Corp., Platt Iron Works, Tracyfier Department of Blaw-Knox Co., Frank H. Schaefer Co., Goetz Gasket & Packing Co. M. Sheffler, pres., Samuel Gross, treas., T. J. Kenny, sales eng., J. J. McCarthy, sales eng.

125 Silent Automatic Sales Co., Philadelphia,
126 Pa.
Oil burners. William J. Debler, branch mgr.

118 Silent Glow Oil Burner Co., Hartford, Conn.

145 Simplex Oil Heating Corp., New York.
Models of Simplex PA (full automatic-domestic type) burners, in four sizes, and Simplex improved turbine type burners and Simplex oil pump and fan unit. John H. Blake, Jr., pres., Clifton L. Butler, treas., H. J. Carroll, Philadelphia branch mgr.

757 Skidmore Corp., Chicago, Ill.

758 Skidmore return-line, vacuum, boiler-feed and condensation pumps. W. S. Logan, V. D. Milliken and H. W. Parker.

520 Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Skinner unit heaters. M. G. Skinner, v.p., R. J. Tenkenohoy, P. Lo Buono, George Nelson, N. Sander.

420 David H. Smith & Sons, Brooklyn, N. Y.
Smith steel-plate frame quadruple punch and shear and Smith angle-bending rolls. Dudley J. Smith, v.p., William H. Kay, machinery sales mgr., Philadelphia Fabricating Co.'s representative, Philadelphia.

344 H. B. Smith Co., Westfield, Mass.

345 Cast iron boilers and radiators. William T. Smith, pres., Edwin W. Smith, treas. and gen'l mgr., George E. Shepard, Jr., ass't treas., Stanley K. Smith, clerk, A. L. Finlay, ass't clerk, F. F. Wholean, adv. mgr., representatives of Philadelphia office.

403 Smith Twin Tubular Boiler Co., Inc., Philadelphia, Pa.
Smith Twin tubular and steel heating boilers. Howard G. Smith, pres., C. Elmer Woolston, treas., Robert Y. Crosby, sec., Walter R. Dome and E. H. Littlefield.

712 James Spear Stove & Heating Co., Philadelphia, Pa.
Spear's warm-air distributor No. 247. W. R. Taylor, pres., W. J. R. Taylor, treas., James Spear, Jr., sec., C. W. Klebe, R. E. Bedford, T. P. Jacob, F. B. Sparks, J. P. Simons.

258 Sprayo-Flake Co., Milwaukee, Wis.
Sprayo-Flake insulation, sprayed on with guns. R. E. Bennett, v.p. and sales mgr., Harrison Cooper, adv. mgr.

300 Spencer Heater Co., Williamsport, Pa.

301 Cast-iron and steel boilers. In Booth
1041 1041 one cast-iron boiler and one steel boiler will be exhibited under fire. S. J. MacMullan, sales mgr., F. W. Earnest, Jr., adv. mgr., J. A. Waddell, chief eng.

547 Star Expansion Bolt Co., New York.
Expansion bolt products and drilling devices. R. A. Armie, sales mgr. and adv. mgr. Harry Fox, eastern district sales mgr. and M. G. Hayden.

516 Stat-Amatic Instrument & Appliance Co., Hartford, Conn.
Stat-Amatic temperature control equipment. H. J. Blakeslee, pres., H. N. Porter, sales mgr. and J. J. Hammel, special representative.

760 Staynew Filter Corp., Rochester, N. Y.

761 Protectometer Panel air filters. L. L. Dollinger, pres., C. L. Whitmore, v.p., N. A. Hamill, sec.

261 Emil Steinhorst & Sons, Inc., Utica, N. Y.
Steinhorst gas-fired warm-air furnace. Theodore F. Steinhorst, treas., William C. Steinhorst, sec.

912 Sterling Engineering Co., Milwaukee, Wis.
Thermotrol automatic radiator valve, Compeller motor-driven pump for hot water systems and No. 73 trap for use with unit heaters. George W. Anders, pres., H. M. Parent, Philadelphia, and L. J. Tierney, Boston.

955 Sterling Engineering & Mfg. Corp., Hyde Park, Boston, Mass.

443 Stickle Steam Specialties Co., Indianapolis.

752 Strandwits & Scott, Inc., Camden, N. J.
Webster air washer. William J. Strandwits, pres., treas, and adv. mgr., D. M. Strandwits, v.p., Joseph H. Madara, sec. and sales mgr., F. E. Deckman, C. Trotman, W. F. Schwarts, Marg. O. Strandwits, Charles Morris.

614 Superior Steel Corp., Philadelphia, Pa.

102 Sweet & Doyle Foundry & Machine Co.,
103 Troy, N. Y.
Utility Style gas-conversion burner and S. & D. Custom Built burner, shown in operation. John E. MacLean, pres., Edward C. Doyle, treas., Herbert H. Skinner, sales mgr., Dewey C. Hildebrecht, adv. mgr.

456 Taco Heaters, Inc., New York.

457 Taco water heaters. Elwood S. White, pres., Joseph R. Murphy, sales mgr., Hubert A. Essley.

709 Webster Tallmadge & Co., Inc., New York.
Tallmadge heating system control. Webster Tallmadge, pres. and treas., E. Wainwright, sec., R. M. Wainwright and C. C. Trump, Philadelphia representative.

251 Teesdale Mfg. Co., Grand Rapids, Mich.
Automatic oil pumps. Clyde H. Teesdale, pres., Fred Mundt, v.p. and sales mgr., Stanley F. Teesdale, treas. and sec.

955 Templeton Mfg. Co., Boston, Mass.

108 Texo Heater & Mfg. Co., Covington, Ky.
Sunnyaire gas-fired unit heaters and warm-air furnaces. Allen A. Blomfeldt, pres., William E. Teklenburg, treas. and sec.

441 Thatcher Co., Newark, N. J.
522 Thatcher boilers and radiators. L. V. Lockwood, pres., R. C. Cook, v.p. and sales mgr., M. Wayne, treas., J. P. Lyon, sec., C. Sahler, adv. mgr.

916 Thermal Units Co., Chicago, Ill.

917 Model 20 Thermal Unit heater, Model 20 Thermal Unit cooler, Thermal Unit assemblies without cabinets, concealed radiation cabinet and sections of Thermal Unit castings. F. N. Beeson, pres., J. W. Hubbard, v.p., G. A. Hood, treas., T. W. Caraway, mgr.

307 H. A. Thrush & Co., Peru, Ind.

415 Time-O-Stat Controls Co., Elkhart, Ind.

416 Time-O-Stat automatic controls for all types of heating equipment. J. K. Luthe, pres., R.W. Johnson, v.p., H. B. Payne, sales mgr., T. G. Hereford, adv. mgr., R. V. Inda, A. E. Peterson, G. Corey, D. J. Jones.

409 H. O. Trerice Co., Detroit, Mich.

957 Typhoon Fan Co., Inc., New York.
Fans and blowers. J. F. Dailey, pres., J. Schoenfeld, treas., N. Bjorklund, sales mgr., E. Schnure, adv. mgr., and Robert Dunlevy.

612 Union Carbide & Carbon Co., New York.

845 U. S. Bureau of Standards, Washington,
846 D. C.

556 U. S. Gypsum Co., Chicago, Ill.
Insulation products, Thermofill, Red Top insulating board, Flax-li-num, Pyrocell. A. L. Sleeper, district mgr., L. F. Johnson, mgr. insulation board sales, W. Plumer, S. N. Havlick and M. D. Stephens.

658 U. S. Radiator Corp., Detroit, Mich.
to Capitol boilers and Pacific steel boilers,
660 all jacketed. J. F. McIntire, v.p., R. P. Henderson, sales mgr., R. F. Connell, mgr. Capitol Testing Laboratories, D. E. Walsh, Philadelphia branch mgr., and Harley Smith.

852 Vinco Co., Inc., New York.

853 Miniature glass heating systems, showing the behavior of clean and dirty boiler waters and the action of various cures. Leo Sherman, pres., R. F. Carton, sec. and sales mgr., John Natoli, Ray Elardo and Donald Carton.

1005 Wagner Electric Corp., St. Louis, Mo.

712 Warm Air Furnace Fan Co., Cleveland, O.
Spear warm-air distributor, Miles automatic furnace fan, Reed furnace filter. Julius F. Janes, pres., James C. Miles, v.p., L. M. Uhl, treas. and sec., F. H. Mason, sales mgr. J. Polshek, representative.

754 Warren Webster & Co., Camden, N. J.

755 Webster systems of steam heating, in-
808 cluding Webster Moderator system, Web-
809 ster Type "R" system and Webster vacuum system. Also Webster systems of steam circulation at process pressures, using Webster Series "78" traps. Warren Webster, pres., Warren Webster, Jr., v.p., E. Kesler Webster, sec., E. K. Lanning, sales mgr., H. F. Marshall, adv. mgr., B. F. Lerch, ass't adv. mgr., H. R. Betterton, eng., C. G. Binder, eng., Karl Rohlin, eng., R. B. Beahm, co-mgr. Philadelphia office, Karl Rugart, Philadelphia.

347 Weil-McLain Co., Chicago, Ill.
to Boilers and radiators. Martin Weil, sec.,
349 and Thomas Casserly, representative.

805 Weil Pump Co., Chicago, Ill.
Weil pumps, Viking pumps, Eagan pumps and receiver sets. Walter H. Eagan & Company's representatives: Walter H. Eagan, pres. and treas., E. M. Moore, sec. J. F. MacGonigal, R. C. Meyer and F. Gilkeson.

801 Westco-Chippewa Pump Co., Davenport,
802 Iowa.
Westco circulating and refrigerating and Pomona deep-well turbine pumps. Crain Pump and Supply Company's representatives: Howard S. Irons, George J. Kohnle and Lynn R. Parrish.

742 Westinghouse Electric & Mfg. Co., East
743 Pittsburgh, Pa.
820-821

460 W. P. Whittington, Inc., Indianapolis, Ind.
461 W. P. Whittington, pres., Kenneth DeOme, sales mgr.

748 Wickes Boiler Co., Saginaw, Mich.
749 Wickes L-O steel heating boiler. E. B. Wickes, v.p., J. Robert Fortune, sales mgr., and representatives of F. C. Duemler, Philadelphia, Koithan & Pryor, New York, Smith & Courtney, Richmond, Va., and W. G. Moorman, Buffalo.

1010 Wiedemann Machine Co., Philadelphia, Pa.
Drop forged steel vises, "EDA" turret punch, and spring winder "KLIKA." Theodore Wiedemann, pres., Henry Bockrath, v.p., Joseph H. Bockrath, treas. and sec., L. H. Hurlock, sales mgr., and G. A. Hancock, W. G. Chryst, and H. Wiedemann.

1042 Wilcolator Co., Aqualator Div., Newark, New Jersey.
Aqualator residential and industrial humidifiers. Marvin C. Barnum, sales mgr., Edward McK. Hunt.

1043 Wilson Bros., Philadelphia, Pa.
Wilson Koal-Draftor. K. H. Jaeger, R. G. McMorris.

806 Winchester Repeating Arms Co., New
807 Haven, Conn.
Winchester copper radiators. W. A. Tobler, pres., Leslie H. Thompson, treas., Henry Brewer, sec., Harry E. Jenkins, sales mgr., C. S. Hutt, adv. mgr., George A. Foisy, T. H. Hingston, C. H. Franklin.

305 L. J. Wing Mfg. Co., New York.

306 Wing featherweight unit heaters, Scruplex fans, Scruplex exhausters, turbine blowers, motor driven blowers, centrifugal turbine blowers for gas producers, and compressed air driven blower for mine ventilation. Alfred E. Seelig, pres., Harry S. Wheller, v.p., Victor H. Carples, treas. and sec., Harry S. Wheller, sales and adv. mgr., and Sheffler-Gross Co., C. L. Meyer, J. M. Hancock, J. Brower, I. F. Goodfriend, and C. H. Smith, representatives.

138 Winslow Boiler & Engrg. Co., Chicago, Ill.

139 Challenger model Kleen-Heet, also "800" Series Kleen-Heet. E. J. Grant, adv. mgr., C. E. LaRoche, pres. LaRoche Engineering Corp., Philadelphia.

812 Wolverine Tube Co., Detroit, Mich.

813 Wolverine copper radiators, unit heaters, steam and water tubing (copper), etc., Charles C. Limbocker, pres., Harry J. Hooks, v.p. and treas., Jack Colyer, sec., Vaughn J. Jolliff, sales and adv. mgr., P. J. McIntyre, chief eng., Thomas Dalton Smith, Irving J. Belanger, Harry Vandenberg, Arthur Hopkins.

521 Wood Conversion Co., Cloquet, Minn.
Balsam - Wool and Nu - Wood insulating materials. P. R. Van Houten.

504 Wright-Austin Co., Detroit, Mich.
Wright-Austin line of steam traps, steam and oil separators, water columns and water column trimmings, including Airxpel traps, weighted try cocks. C. Burt Walter, pres., Edwin Elliot.

940 Yale & Towne Mfg. Co., Stamford, Conn.
941 Yale & Towne material handling equip-
1022 ment. R. B. Kite, H. L. Higgins, H. A.
1023 White, H. R. Bungay, Jr., R. E. Wilson, W. F. Redmond, C. O. Hedner.

552 York Heating & Ventilating Corp., Phila-
553 delphia, Pa.
610 York unit heaters, blast radiation and
611 air-conditioning units. H. C. Garrison, Donald Miller, M. E. Barnard, C. H. Israel.

862 Young Radiator Co., Racine, Wis.
Young unit heaters. F. M. Young, pres., W. H. Schleck, treas. and sec., F. H. Ine, sales mgr., A. E. Emerson, Philadelphia, William H. Wix, Baltimore, Peter J. Donahue, New York, William C. Edgar, Pittsburgh, A. D. Porter, Cleveland, A. W. Jones, Greensboro, N. C., and M. W. Smith, Baltimore.

Your Badge is Your Admission Ticket

Members and guests of the A.S.H.V.E. will be admitted to the exposition by displaying their badges.

Program—36th Annual Meeting

American Society of Heating and Ventilating Engineers

MONDAY, JANUARY 27

10:30 a.m. Reception of guests and registration — Benjamin Franklin Hotel.
Time set aside for visitors to accept invitation of the heating and ventilating manufacturers of Philadelphia and vicinity to inspect manufacturing processes and plants.
2:30 p.m. Council meeting.
8:00 p.m. Heating and Ventilating Exposition, Commercial Museum.
11:30 p.m. Buffet Supper, Benjamin Franklin Hotel.

TUESDAY, JANUARY 28

Benjamin Franklin Hotel.

9:00 a.m. Reception and registration.
9:30 a.m. Greeting by John Cassell, Honorary Chairman.
Response by President Thornton Lewis.
Introduction of R. C. Bolsinger, General Chairman.
Report of Tellers.
Power from Process and Space Heating Steam, L. A. Harding.
Report of Council.
Report of Committee on Increase in Membership, C. W. Farrar.
12:30 p.m. Luncheon for society officers and authors of papers.

Commercial Museum.

2:00 p.m. Report of Finance Committee, W. T. Jones.
Pressure Difference Across Windows in Relation to Wind Velocity, by J. E. Emswiler and W. C. Randall.
Air Infiltration Through Various Types of Brick Wall Construction, by G. L. Larson, D. W. Nelson and C. Braatz.
6:30 p.m. Dinner Meeting Committee on Research — *Benjamin Franklin Hotel.*
8:00 p.m. Heating and Ventilating Exposition, members and ladies, *Commercial Museum.*

WEDNESDAY, JANUARY 29

Benjamin Franklin Hotel.

9:30 a.m. Report of Committee on Research.
Report of Research Director.
Surface Transmission Coefficients, by F. B. Rowley, A. B. Algren and J. L. Blackshaw.
Absorption of Solar Radiation in its Relation to the Temperature, Color, Angle and other Characteristics of the Absorbing Surface, by F. C. Houghten and Carl Gutberlet.
Preventing Condensation on Interior Building Surfaces, by Paul D. Close.

Commercial Museum.

2:00 p.m. Code for Testing and Rating Unit Heaters.
Method of Testing Unit Heaters Suitable for Field Use, by L. S. O'Bannon.
Measurement of the Flow of Air Through Registers and Grilles, by Prof. L. E. Davies.
6:30 p.m. Past Presidents' Dinner, *Benjamin Franklin Hotel.*
8:00 p.m. Heating and Ventilating Exposition — *Commercial Museum.*

THURSDAY, JANUARY 30

Benjamin Franklin Hotel.

9:30 a.m. Report of Continuing Committee on the Rating and Testing of Low Pressure Steam Heating Boilers.
The Rating of Heating Boilers by Their Physical Characteristics, by C. E. Bronson.
Report of Committee on Garage Ventilation.
Report of Committee on Natural Ventilation.
Some Studies of Airation of Garages, by W. C. Randall and L. W. Leonhard.

Commercial Museum.

2:00 p.m. Report of Guide Publication Committee.
Pipe Sizes for Hot Water Heating Systems, by Elmer Smith.
Panel Warming, by L. J. Fowler.
Development of a Method for Heat Regulation, F. I. Raymond and R. D. Lambert.
7:00 p.m. Annual Banquet and Dance — *Benjamin Franklin Hotel.*

FRIDAY, JANUARY 31

Benjamin Franklin Hotel.

9:30 a.m. Amendments to By-laws.
Installation of Officers.
Friction Losses and Observed Static Pressure in Domestic Fan Furnace Heating Systems, by A. C. Willard and A. P. Kratz.
Air Conditioning of the Halls of Congress, by L. L. Lewis and A. E. Stacey.
Tests of Disc and Propeller Fans, by A. I. Brown.
Resolutions.
1:30 p.m. Council Meeting.

Ladies Program

MONDAY, JANUARY 27

Benjamin Franklin Hotel

4:00 p.m. Tea.
6:00 p.m. Dinner.
9:00 p.m. Theatre party.

TUESDAY, JANUARY 28

12:00 p.m. Luncheon.
1:30 p.m. Motor bus to Valley Forge.

WEDNESDAY, JANUARY 29

12:30 p.m. Luncheon.
2:00 p.m. Matinee.
4:00 p.m. Tea.
6:30 p.m. Dinner for wives of past presidents.

THURSDAY, JANUARY 30

11:30 a.m. Breakfast-Bridge.
4:00 p.m. Tea.

FRIDAY, JANUARY 31

9:30 a.m. Shopping Tour.

ALL This Talk *about* Kleen-Heet

—Let the Show show you what's back of it

1929 was Kleen-Heet's biggest year to date . . . biggest for Kleen-Heet *dealers*. . . biggest for *us.* It was also Kleen-Heet's most "talked-about" year. Product, plans, sales-methods, *all* were much discussed throughout the industry. Therefore, *one profitable thing* the Show can hold for you is a visit to the KLEEN-HEET exhibit (Booths 138-139). We have plenty of evidence that 1930 will be a record-smasher not only for us but for every good oil burner in the field. Let's get acquainted, at the Show, and talk things over; we'll look for you. THE WINSLOW BOILER & ENGINEERING CO.,

844 Rush St., Chicago Galesburg, Ill. New York

HEATING AND FORECAST

by C. STANLEY TAYLOR

CLASSIFIED as a part of the building field, the heating and ventilating industry is looking forward to 1930 business with growing confidence. Opinions as to the building activity, which may be expected during the year 1930, vary considerably and are so entangled with unusual economic developments that there seems to be no positive average opinion, such as were available in previous years. If the new building projects which are on the architects' boards and under discussion for 1930 do eventuate, or even if 60% of them become actualities, the heating and ventilating industry will enjoy a prosperous year.

Optimistic forecasts of activity in the building field which have been made by President Hoover are entirely supported by the 1930 HEATING AND VENTILATING forecast.

The HEATING AND VENTILATING forecast has been based on individual confidential reports received from engineers, architects, contractors and manufacturers all over the country, and has made possible a picture of future activity which cannot be obtained in any other manner. The fact that HEATING AND VENTILATING is one of Building Division group of National Trade Journals, Inc., which includes *The Architectural Forum, Building Age, Building Material Marketing, National Builders Catalog,* and *Good Furniture and Decoration,* has opened countless contacts,

	Northeastern States			North Atlantic States			Southeastern	
Building Type	Building Value In Millions	For Heating	For Vent'ing	Building Value In Millions	For Heating	For Vent'ing	Building Value In Millions	For Heating
Automotive	$23	$2,102,562	$350,427	$47	$4,282,245	$713,708	$6	$586,710
Banks	37	4,007,446	1,512,244	31	3,349,896	1,264,112	2	215,129
Apartments	27	2,943,091	138,826	325	34,551,134	1,629,771	9	966,115
Apartment Hotels	2	309,992	59,614	65	6,765,262	1,301,012	8	808,516
Clubs, Fraternal, etc.	6	579,740	347,844	44	4,465,310	2,679,186	2	224,270
Community and Memorial	6	643,700	128,740	26	2,648,600	529,700	1	86,100
Churches	12	1,255,854	507,416	44	4,421,874	1,786,616	30	2,995,947
Dwellings (Below $20,000)	25	2,326,659	61,879	34	3,193,039	84,921	10	967,114
" ($20,000-$50,000)	12	1,425,324	237,554	44	5,323,440	887,240	8	992,364
" (Over $50,000)	13	1,276,838	266,008	39	3,794,304	790,480	6	637,632
Hotels	14	1,364,111	556,780	79	7,636,257	3,157,656	32	3,127,709
Hospitals	33	3,516,324	1,339,552	161	16,959,978	6,460,944	11	1,207,552
Industrial	14	1,019,432	143,582	58	4,163,021	586,341	24	1,702,935
Office Buildings	56	5,212,904	424,965	251	23,072,569	1,880,916	1	101,844
Public Buildings	14	1,586,933	428,901	88	9,788,290	2,645,484	7	809,622
Schools	48	4,879,230	1,914,208	188	19,216,290	7,535,800	30	3,065,406
Stores	15	1,455,655	774,285	74	6,968,802	3,706,815	9	826,297
Theatres	12	1,298,880	1,180,800	21	2,337,533	2,125,030	10	1,104,048
Welfare	29	2,681,892	874,830	60	5,496,935	1,792,479	6	535,246
TOTAL VALUE	$402	39,886,567	11,248,455	1,685	168,434,779	41,558,211	215	20,950,556

Table I. Distribution of Heating and

VENTILATING *for* 1930

Director of Research,
National Trade Journals, Inc.

not only with engineers but with architects, contractors, realtors and building material dealers.

The present forecast, therefore, has been developed by the largest group of building publications in the field.

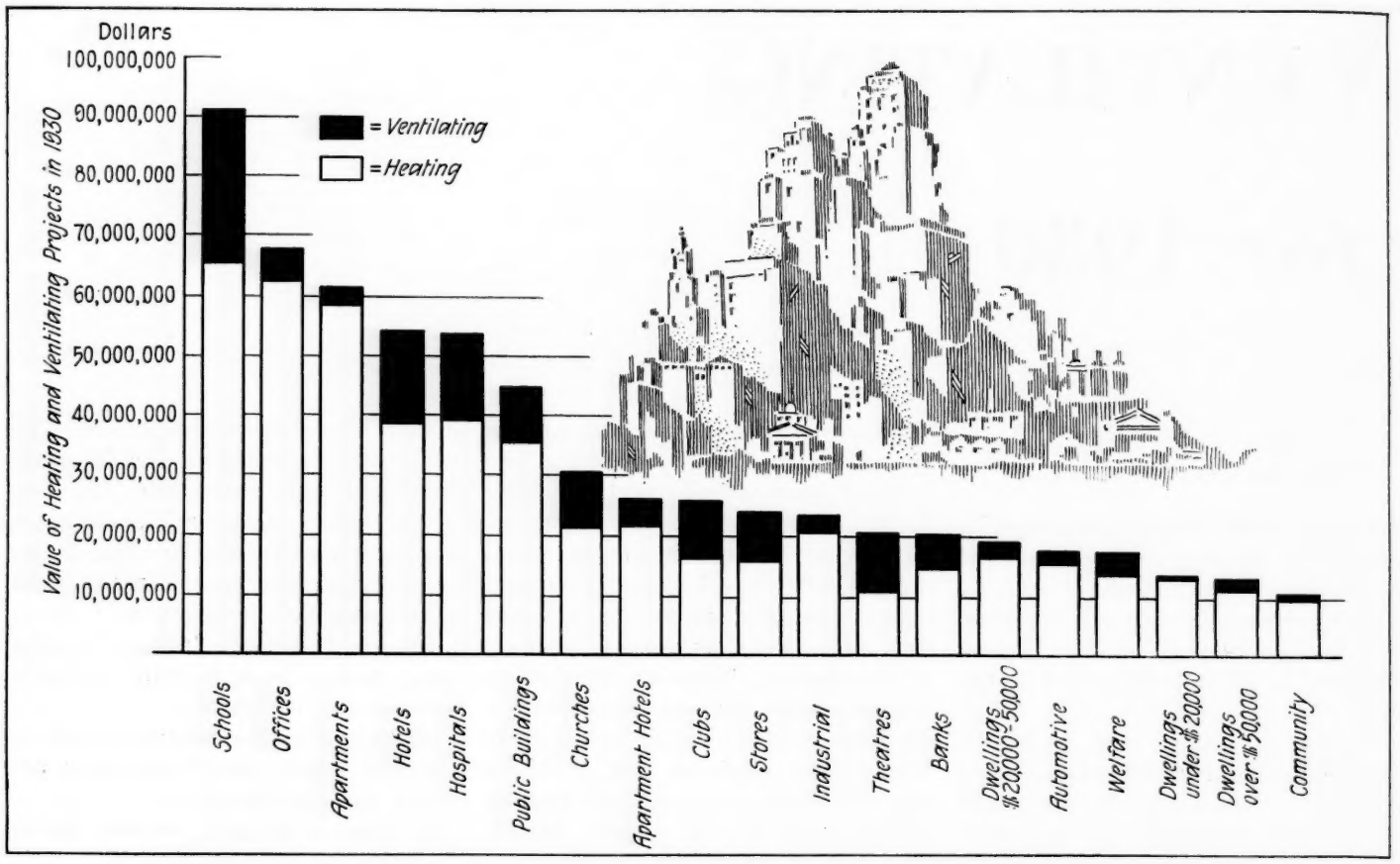
To a great extent, the engineers, contractors and architects of this country represent the advance guard of building construction. They constitute the first group which reports changing trends in the volume and type of building construction. They know and understand what is going to happen. The reason for these conditions is obvious because engineers, contractors and architects are the first to hear of construction projects of any nature. They are the first to discuss details, outside of the owner's immediate circle of business contacts. The engineer and architect work on plans and specifications long before there is any general knowledge of the construction project. The contractor is called in for information and for preliminary figures. Thus, this group has an approximate knowledge of future building activity, and the close contact maintained with them by the Research Department of National Trade Journals, Inc., makes possible this intimate view of the future.

Summing up the general situation, we find these significant facts arrayed for consideration:

1. General demand for new build-

States	Southwestern States			Middle States			Western States		
For Vent'ing	Building Value In Millions	For Heating	For Vent'ing	Building Value In Millions	For Heating	For Vent'ing	Building Value In Millions	For Heating	For Vent'ing
$97,785	$18	$1,608,101	$284,683	$57	$5,091,831	$848,639	$17	$1,517,328	$252,888
81,180	10	1,133,002	427,584	48	5,142,621	1,940,612	7	771,849	291,264
45,572	26	2,758,840	130,134	95	10,113,142	477,035	68	7,245,651	341,776
169,330	24	2,555,415	491,426	73	7,608,255	1,463,126	36	3,782,168	727,340
134,562	18	1,797,850	1,078,710	76	7,589,100	4,553,460	15	1,524,380	914,628
17,220	5	560,880	112,164	27	2,667,050	533,410	27	2,675,250	535,050
1,210,484	30	2,995,947	1,391,376	71	7,016,793	2,835,068	24	2,375,326	959,728
25,615	11	1,097,619	29,192	41	3,884,446	103,310	16	1,489,571	39,616
165,394	10	1,198,020	199,670	45	5,475,468	912,578	15	1,868,616	311,436
132,840	7	653,769	136,202	35	3,334,972	694,786	11	1,059,964	220,826
1,276,412	77	7,517,678	3,068,440	87	8,589,600	3,505,992	104	10,228,764	4,178,720
460,020	46	4,898,229	1,865,992	94	9,892,656	3,761,012	24	2,539,950	967,600
239,850	21	1,518,086	213,815	141	10,015,295	1,410,605	30	2,110,475	297,250
8,303	42	3,856,870	314,419	256	23,545,578	1,919,477	72	6,663,238	543,199
218,817	19	2,095,280	566,292	146	16,212,937	4,381,875	44	4,890,959	1,321,881
1,202,120	77	7,871,778	3,086,972	223	22,746,316	8,920,124	74	7,586,148	2,974,960
439,520	10	966,583	514,140	44	4,110,292	2,186,325	14	1,363,930	725,495
1,003,680	15	1,678,622	1,526,020	30	3,318,458	3,016,780	9	996,259	905,690
174,537	8	789,479	257,439	34	3,175,830	1,035,537	5	506,956	165,312
7,103,241	484	47,999,976	15,694,634	1,624	159,530,719	44,499,751	615	61,196,782	16,674,659

Ventilating Projects in Nineteen Classes of Buildings



Classification of the Value of Heating and Ventilating Projects for Nineteen Types of Buildings

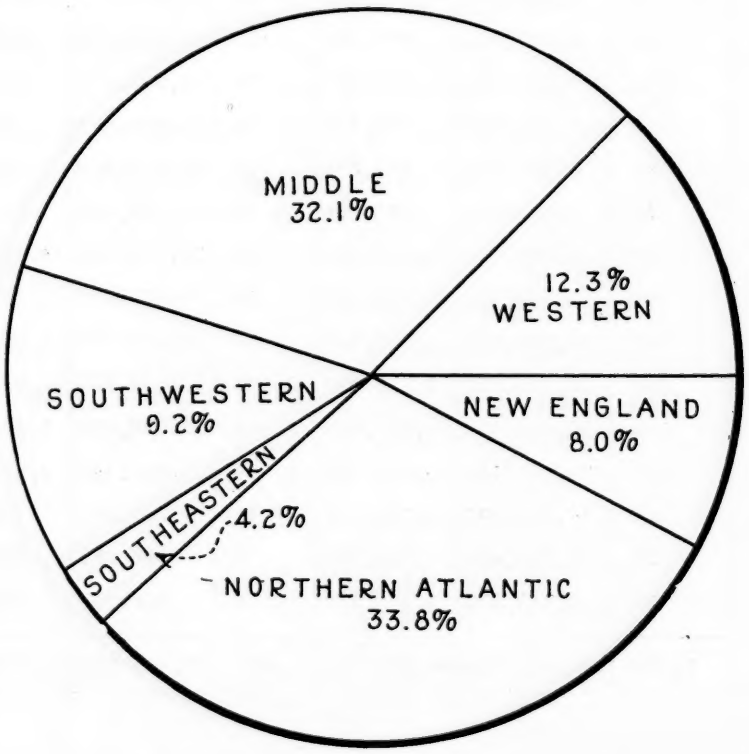
ing construction is approximately the same as it was at the beginning of 1929.

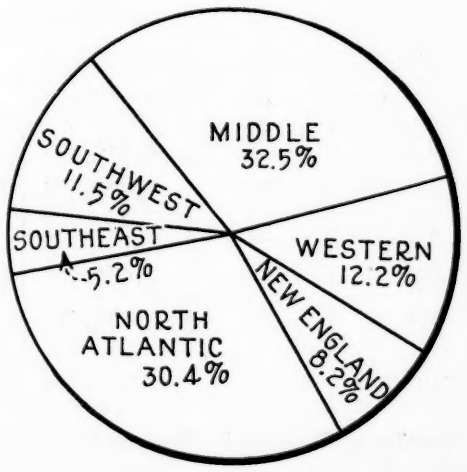
2. The trend toward there being a far greater supply of mortgage money is very definite.

3. The deliberate program of construction which is being started by the government, by states and by municipalities will evidently assume very large proportions.

A study of Table I will show that the volume of business to be done in 1930 by this industry is distributed among the various sections, as follows:

The New England States, 8% for heating and 8.2% for ventilating.
North Atlantic States, 33.8% for heating and 30.4% for ventilating.
Southeastern States, 4.2% for heating and 5.2% for ventilating.
Southwestern States, 9.6% for heating and 11.5% for ventilating.
Middle States, 32.1% for heating and 32.5% for ventilating.
Western States, 12.3% for heating and 12.2% for ventilating.
The North Atlantic and Middle States will account for 65.9% of the heating, and 62.9% of the ventilating work to be carried on during 1930.





How the Heating Projects (left) and Ventilating Projects (below) for 1930 Will Be Distributed. The Areas of the Charts Indicate the Relative Values of Heating and Ventilating

Of the total number of projects, so far as value is concerned, schools constitute the largest single item on our list.

The various types of buildings in the order of their importance to the heating and ventilating industry and the percentage of the total amount of heating and ventilating are:

Schools	14.32%
Offices	10.61%
Apartments	9.65%
Hotels	8.54%
Hospitals	8.49%
Public Buildings	7.09%
Churches	4.76%
Apartment Hotels	4.10%
Clubs, Fraternal	4.08%
Stores	3.83%
Industrial	3.70%
Theatres	3.23%
Banks	3.17%
Dwellings ($20,000-$50,000)	3.00%
Automotive	2.78%
Welfare	2.76%
Dwellings (Below $20,000)	2.10%
Dwellings (Over $50,000)	2.05%
Community and Memorial	1.74%

Schools, offices, apartments, hotels, hospitals and public buildings will account for 58.70% of the total volume of heating and ventilating done in 1930.

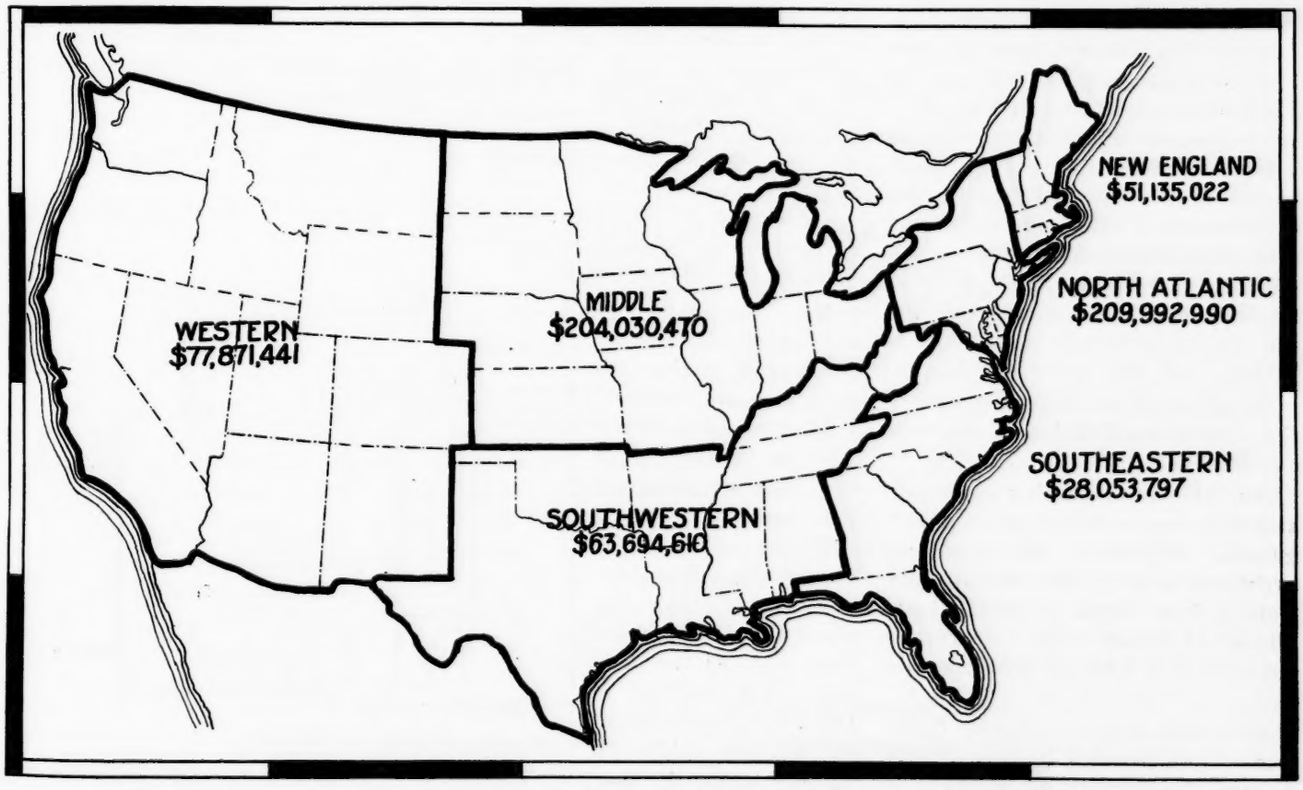
While there was no heating and ventilating survey available for 1929, the changes in percentages of public demand for new buildings as compared with 1929, which indicates, in general, the change in demand for heating and ventilating equipment, show that hospitals will increase more than any other single type of building, the figure being 2.5%. Hotels will also show an increase of 1.1%, schools an increase of 1.1%, community and memorial buildings 0.7%, welfare, Y. M. C. A., 0.7%, automotive 0.6%, dwellings $20,000-$50,000 0.4%, dwellings over $50,000 0.3%, and churches 0.1%.

The largest single change of any one type of building in a particular section of the country will be that office buildings will increase 9.6% in the Northeastern States. Hospitals will increase 6.1% in the Southwestern States. Hotels show an increase of 5.8% in the Western States.

In the Northeastern States, schools will show a decrease of 5%, while industrial buildings in the Southwestern States will show a decrease of 5.4%.

TABLE II
TOTAL FOR UNITED STATES

Building Type	Building Value In Millions	For Heating	For Ventilating
Automotive	$170	$15,188,777	$2,548,130
Banks	137	14,619,943	5,516,960
Apartments	552	58,577,973	2,763,114
Apartment Hotels	210	21,829,608	4,211,848
Clubs, Fraternal, etc.	162	16,180,650	9,708,390
Community and Memorial	93	9,281,580	1,856,284
Churches	217	21,509,669	8,690,688
Dwellings (Below $20,000)	138	12,958,448	344,533
Dwellings ($20,000-$50,000)	136	16,283,232	2,713,872
Dwellings (Over $50,000)	112	10,756,479	2,241,142
Hotels	393	38,464,199	15,744,000
Hospitals	371	39,014,689	14,855,120
Industrial	289	20,529,244	2,891,443
Office Buildings	679	62,450,983	5,091,279
Public Buildings	319	35,384,021	9,563,250
Schools	641	65,365,168	25,634,184
Stores	167	15,691,558	8,346,580
Theatres	97	10,733,800	9,758,000
Welfare	143	13,186,338	4,300,134
Total Value	$5,028	$498,009,379	$136,778,951



Total of Heating and Ventilating Project Values for 1930 in the Six Districts of the United States

The Future of Domestic Oil Burning

An Interview with R. T. Haslam

Manager, Standard Oil Development Company

FEW engineers are in a position better to forecast the developments which may take place in the oil-burner industry than R. T. Haslam, co-author of "Fuels and Their Combustion," and author of numerous papers and technical bulletins. In an interview with Mr. Haslam the editors of HEATING AND VENTILATING learned that the new hydrogenation process of making light oils from heavier oils may have an important effect in furthering automatic heat with oil; that the oil burner of the future may be a gas burner and yet still be an oil burner; that the differential between the manufacturer's cost and the installation cost must be reduced, and that the quality of installations needs to be improved. The interview follows:

Question: What do you think of the future possibilities of domestic oil burning?

Mr. Haslam: Judging from the sale of furnace oils by this company, general comments of engineers, architects and owners, and installations I have seen, I feel that the oil-burner industry has a favorable future and that the outlook is promising.

Question: Is your company carrying on any research looking directly toward the further development of oil burners?

Mr. Haslam: No. But research we are carrying on is indirectly of considerable importance to the oil-burner industry. The hydrogenation process to which a new subsidiary of the Standard Oil Company of New Jersey has patent rights, has a potential field which concerns not only the conversion of coal and other carbonaceous solids into oil, but the conversion of heavy oils, into light oils of high quality.

This will greatly increase the available supply of light furnace oil, and not only that, but will set at rest any possibility of a limitation of the supply of furnace oil. This latter point has been more or less of a drawback to the proper development of the oil-burner industry.

Question: Will the future development of the oil-burner industry be along the lines of burners designed for light furnace oil or burners using heavy oils?

Mr. Haslam: My opinion on this subject has varied during the past 10 years. At first I felt that the light oils were the logical fuel for the domestic burner, but later I believed that due to the price, the heavier oils eventually would take the place altogether of the light oils. At the present I am inclined to think that the oil-burner industry might be further ahead if they had perfected their burners altogether along the lines of those burning light oils, rather than the heavier fuels.

Question: What has caused you to change your opinion as to the relative merits of the two types of fuels?

Mr. Haslam: While the lighter oils are not so cheap, they give better performance. The burners using heavier oils carbonize more easily, especially at the tip of the burner, and tend to cover the boiler with a film of soot. Since it requires only a thin film of this soot to cut down the heat transfer to a large degree, the thermal efficiency of the system as a whole is lowered. While the cost per season is somewhat higher when burning light oil, it is not larger by a percentage equal to the per cent increase in the cost per gallon of the

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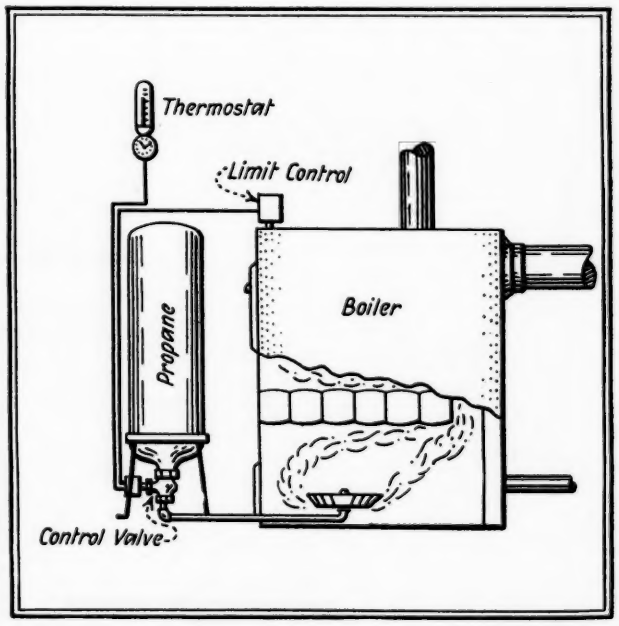
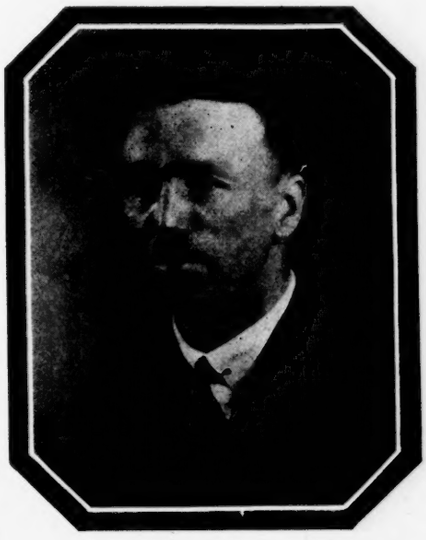


Will the Oil Burner of the Future Look Like This?

The Trend of Automatic Heat with Gas



by **R. B. LECKIE**

Professor of Gas Engineering, Purdue University

IT is axiomatic that an engineer should never appear in the role of prophet unless he is able to demonstrate that his predictions are based on an analysis of past years' records and supported by the trend of present day activities. Consequently, in making the bold assertion that in the near future the majority of American homes will be heated by means of city gas we also must present some reasonable support for our optimism.

To some extent we are influenced in our belief by the fact that gas companies now are desirous of acquiring the house-heating business of the country. Mere desire of acquisition is, of course, not indicative of final success, but when we consider that only a few years ago many utility executives were actually afraid of the heating load, fearing its effect on their distribution systems, the advance of the industry is apparent. At least we now have reached the point where the business is actively being sought and instead of being engaged in discussions of the poor load factor, we find the gas industry formulating plans to secure a large part of the domestic fuel trade of the country even though the market is a highly competitive one.

The records of the past are also encouraging—though apparently in a negative way—in that with very little effort on the part of the utility companies the number of gas-heated homes has steadily increased each year. It is estimated that installation of gas-fired heating plants is proceeding at an annual rate in excess of 100,000.

Strongest of all reasons for our belief that a wonderful future exists for the gas industry in the house-heating field is the knowledge that this modern age desires sanitary, automatic methods of providing the heat necessary in our homes. Public sentiment is at least favorable to the gas industry as the logical supplier of smokeless fuel and should prove a powerful ally. Much thought has been given in recent years to the subject of coal conservation, and this, in conjunction with the efforts of smoke abatement leagues, has focussed public attention on the use of smokeless fuels.

Students of history are aware that six hundred years ago the use of "raw" coal was prohibited in London on account of the foul smoke which it produced. In that respect they were far ahead of us in those bygone days. Greatly to be desired are smokeless cities and none of us believes that such a consummation will be attained by means of prohibitory laws with which the American public has been surfeited. Though future generations will most assuredly criticize this one severely for its lack of wisdom in the use of fuels, final solution of the smoke nuisance will only be achieved through the use of fuels adopted not only for their cleanliness but also because of their ease of control and elimination of labor.

The stage is therefore set with a public demanding healthful and labor-free heating methods in the home and an industry ready to deliver automatic heat. There remains the question of cost and this we believe to be in process of adjustment. So far as operation costs are concerned the attractive rate schedules now offered by the utility companies bring gas heat within reach of the majority of householders.

Use of gas for domestic heating has not developed more rapidly, not because of the greater cost of gaseous fuel compared to crude fuels, for that has been offset by advantages which gas heat possesses, such as convenience, cleanliness and dependability, but because of the theory favored by many utility companies, that only by persuading the customer to install new heating equipment specifically designed for gaseous fuel could gas successfully compete with other fuels in the domestic market.

If this theory were followed, many centuries would elapse before gas-heated homes became universal. Fortunately for the public, the fallacy of such a theory has been demonstrated and the gas industry has thereby been relieved of a serious handicap which the oil industry never accepted. Credit must be given to those manufacturers of gas-fired equipment who have developed the conversion type of gas burner for domestic furnaces while meeting with strong opposition from the industry they hoped to benefit.

In the past it has been contended that furnaces equipped with conver-

(*Continued on Page* 33)

Residence Heated by Thermal Storage Electric System

Electric House Heating

Its Present and Future

by **C. P. YODER**
Sales Manager, Erie County Electric Company, Erie, Pa.

ELECTRICITY has long been recognized as an ideal source of heat but its cost and the lack of scientifically developed equipment have delayed its general acceptance. In some few instances, notably in parts of Canada and along the Pacific coast, an abundance of electric energy at low cost together with high cost of fuels has encouraged its use for this purpose. In these cases usually some form of simple resistance heater was used, manually controlled and with no thought to real economy.

There are three factors that enter into the development of electric house heating; the home owner must demand the comforts and convenience this form of heat can produce; the manufacturers must develop equipment that will accomplish these results as well as produce an electric load, the characteristics of which are attractive to the electric utility, and finally the utility must recognize these characteristics as of sufficient importance to justify the establishment of promotional rates for this type of load. There is now no doubt as to the attitude of large groups of home-owners, and present indications encourage the belief that the manufacturers and central stations also are awake to the situation.

A number of units now on the market and widely used may be classed as occasional heaters. They may be attached to any convenience outlet and are useful for spring and fall service and to supplement the regular heating system.

But what the home-owner really is interested in is a complete system of heating having all the refinements of automatic control, the maximum of efficiency and operating cost consistent with the service rendered. Two systems are now on the market having characteristics that appear to meet all these requirements and the development of which shows every indication of providing real competition to other forms of heat in the field where the best is a requisite.

The system developed by the American Electric Heating Co., of Erie, Pa., operates upon the controlled demand principle and utilizes automatically controlled convection heaters, called Thermotrols, in each room to be heated. In addition, a motor operated switching device, called a Kilotrol, prevents the demand from going beyond a predetermined amount.

The Hall Electric Heating Co., Philadelphia, Pa., has developed a system known as Hallmark heating. This operates on the stored heat principle and utilizes electric energy during the off-peak period of the electric company. It consists of a central heating unit which may be substituted for the present hot air, water or return steam heating unit

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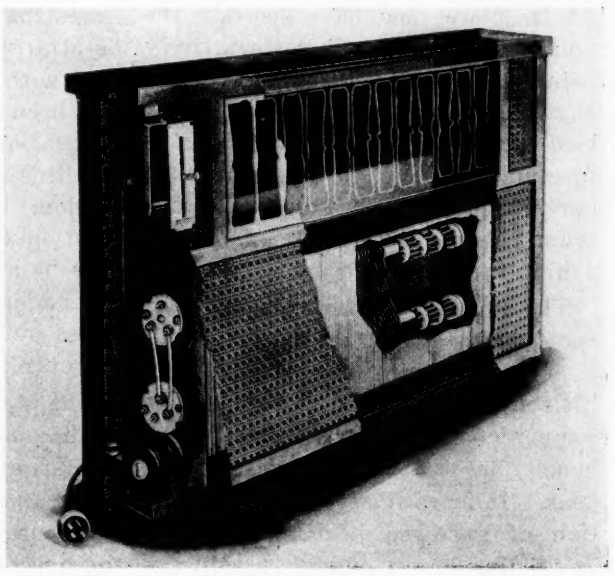
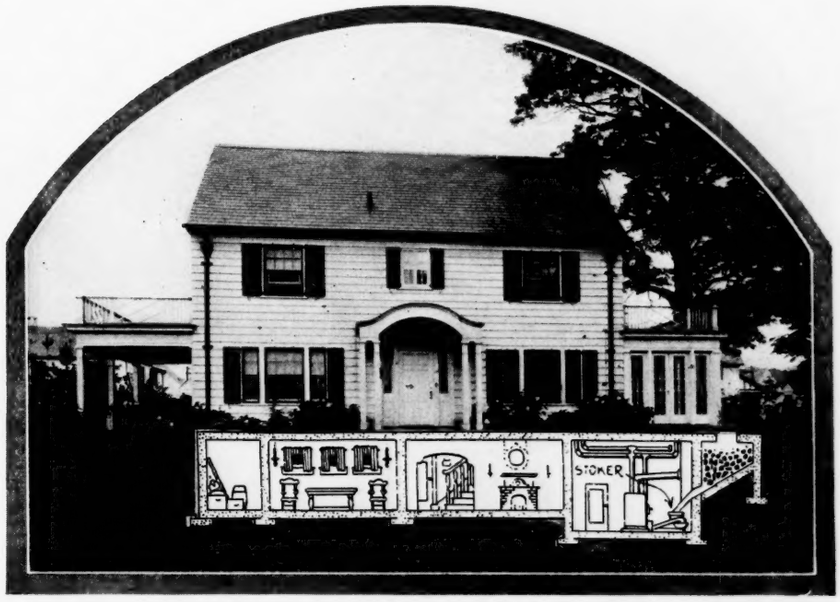


Phantom View of Thermotrol

Automatic Heating with Anthracite

by **G. A. THOMAS**
Anthracite Coal Service



Automatic Feed of Coal to the Stoker Makes Such a System Almost Completely Automatic

WITHIN the scope of twenty years remarkable achievements toward greater comfort and more widely varied luxuries have been effected. Few now are the homes in which the master does not enjoy the convenience and luxury of a motor car and a radio. Electricity has displaced the odorous kerosene lamp of yesterday; the back-breaking wash tub has long since gone into the discard and even the dishes are now washed to the comforting hum of a tiny electric motor. The garbage can has gone the way of the wash tub as the modern incinerator now performs the disagreeable chore of disposing of household refuse. Modern science has lent its mighty forces to the task of making the modern home comfortable, convenient, luxurious.

Anthracite, too, has been modernized and any heating plant, whether it be steam, vapor, hot water, or warm air can be made entirely automatic, including the stoking of coal and removal of ash. The present domestic stoker is so constructed that its installation in the average heating plant is a simple matter.

While stokers have been used in the industrial field for a great many years, it is only during the last few years that serious attention has been paid to their development for domestic use. The problems are somewhat different and require entirely different treatment. For instance, noise is not objectionable in the industrial stoker, while equipment placed in the home must be quiet. Furthermore, a domestic stoker, to be successful, must be so constructed that it can readily be installed in existing heating plants of various types. Stokers for domestic use frequently must be installed without appreciable interruption in the heating service. These do not apply in the case of industrial stokers.

In many anthracite stokers a screw, or worm, feeds the coal stored in the hopper to the fire by the underfeed method, and the ash is removed and placed in dustless receptacles outside the furnace by means of a screw and conveyor system.

When the underfeed method of firing was first brought out, so-called authorities claimed that anthracite could not be handled in this manner. Since then, however, several thousand installations have been put into service and have proved conclusively that this is a satisfactory method of burning anthracite in the domestic heating plant.

Other manufacturers of domestic stokers employing the side and overfeed methods of feeding coal have perfected their devices, which also include an arrangement whereby the ash is deposited into a convenient can below the stoker, and satisfactory results are being obtained.

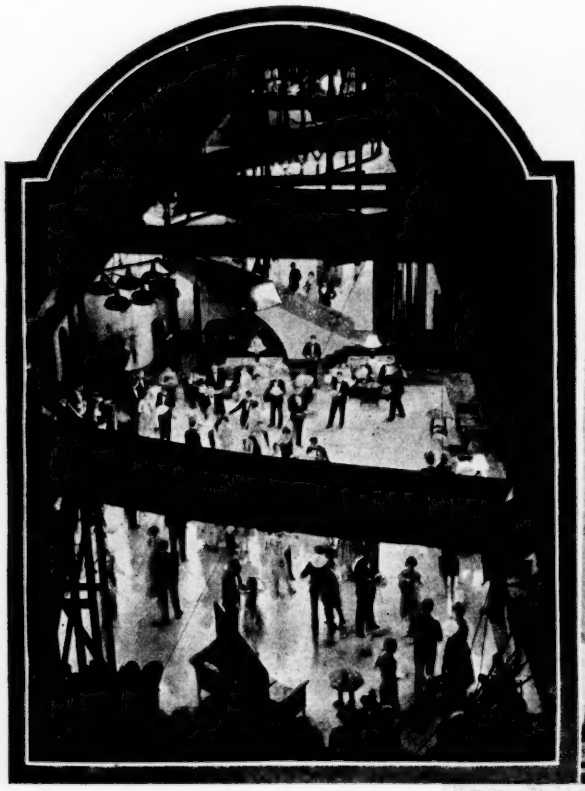
Domestic stokers use either anthracite buckwheat or rice. These sizes cost considerably less per ton than the larger sizes generally used for domestic heating. Until the advent of the domestic stoker, buckwheat and rice were included under the head of "steam" sizes; for these economical sizes of anthracite were utilized for steaming purposes where low cost, smokeless operation was important, second only to efficiency.

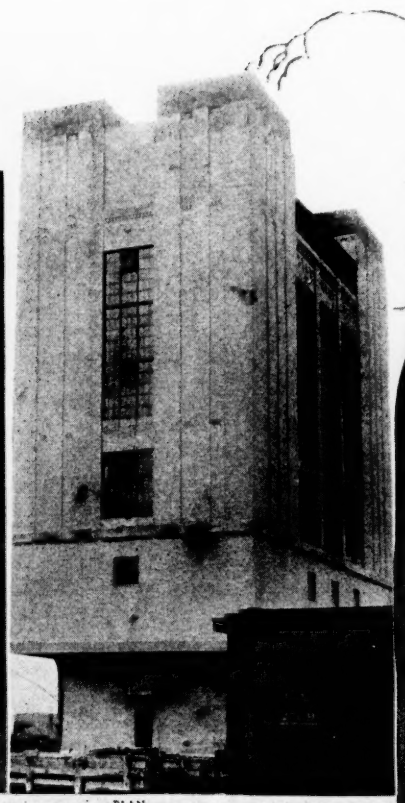
When used in connection with a thermostat—and most stokers are installed that way—an even temperature can be obtained, no matter how quickly the outside temperature may drop. The stoker is, at all times, furnishing heat in proportion to the requirements. Another advantage of this continuous heat, in proportion to the requirements, is that it does not injure the boiler, as continuous heat does not subject the boiler to repeated expansion and contraction.

(*Continued on Page* 40, *Column* 2)

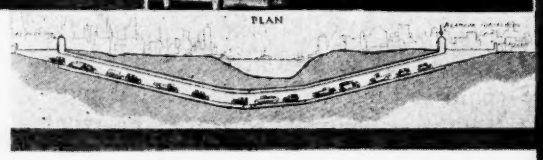
IT COULDN'T BE DONE WITHOUT THE HE

The varied results shown on these and the following pages are made possible by ap-



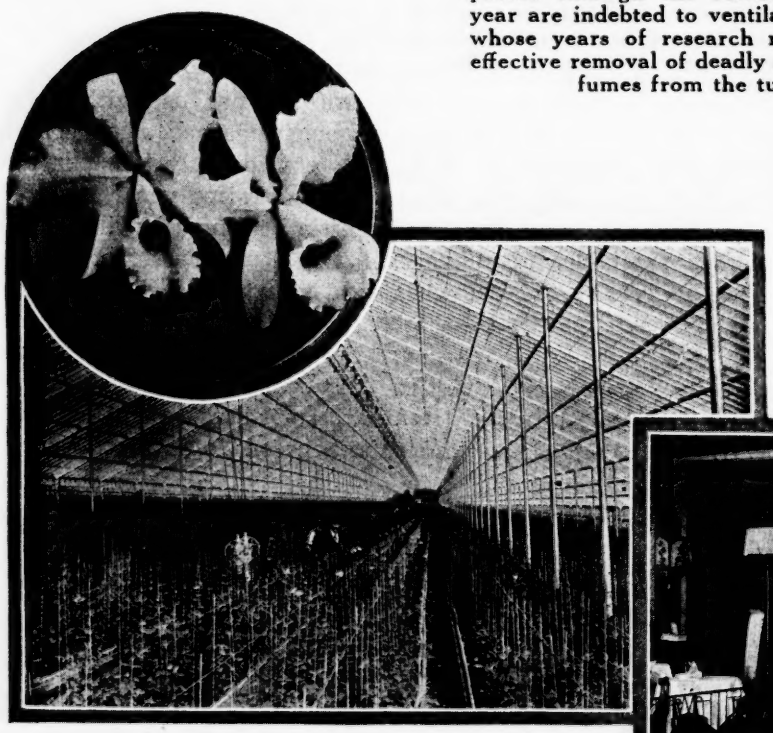


In motion-picture studios focused heat is as necessary as focused light in meeting the exacting requirements for making films to supply our 20,000 movie theatres.



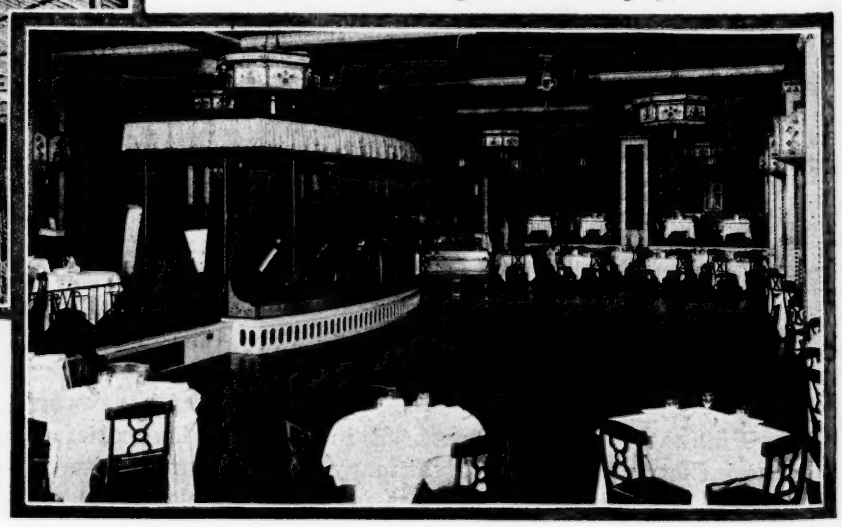
Drivers of the twenty-cars-a-minute which passed through the Holland tunnel last year are indebted to ventilating engineers whose years of research resulted in the effective removal of deadly and unpleasant fumes from the tunnel.

(Above) If our coal mines, which produce 550 million tons per year were not adequately ventilated the salesmen of oil and gas burners would be in Paradise—for there just wouldn't be any coal.



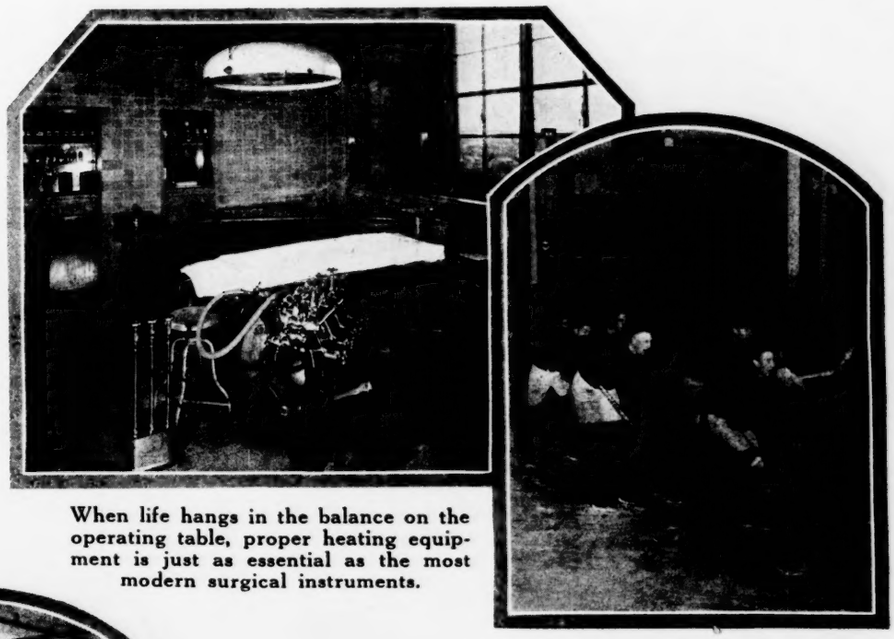
(Below) The difference between air conditions in the basement grille in a modern hotel and those in a Harlem night club is due to a well-designed ventilating system.

Such tender blossoms as cattleya, cypripedium, arctosis, geum, and nemophila depend for their life in cold weather on an adequate heating plant in the greenhouse.



HEATING AND VENTILATING INDUSTRY

plications of the products of our industry—Heating and Ventilating Equipment is not confined to the everyday uses of Heating homes, hotels and factories, but extends to almost every possible phase of the activities of our civilization.



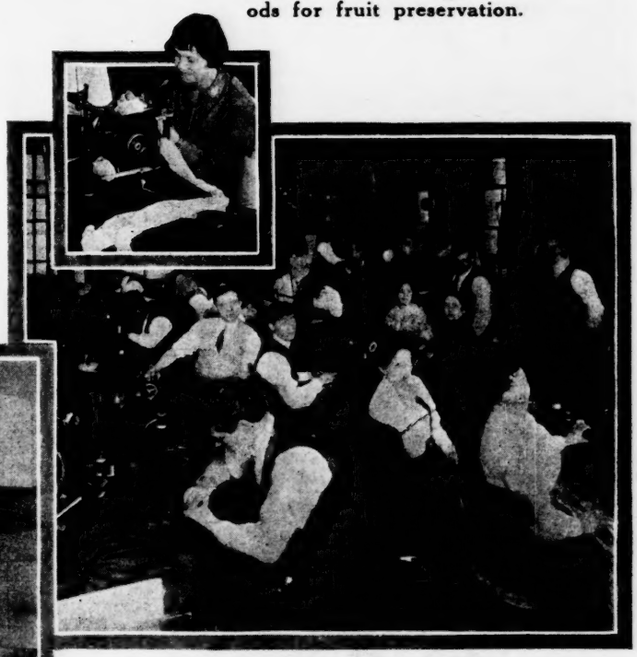
When life hangs in the balance on the operating table, proper heating equipment is just as essential as the most modern surgical instruments.

Behind the enthusiasm which runs high at the indoor hockey game between the New York Rangers and the Chicago Blackhawks is the refrigeration and heating engineers who made the event possible.

(Left) "Yes, We Have No Bananas" loses its point under modern cooling methods for fruit preservation.

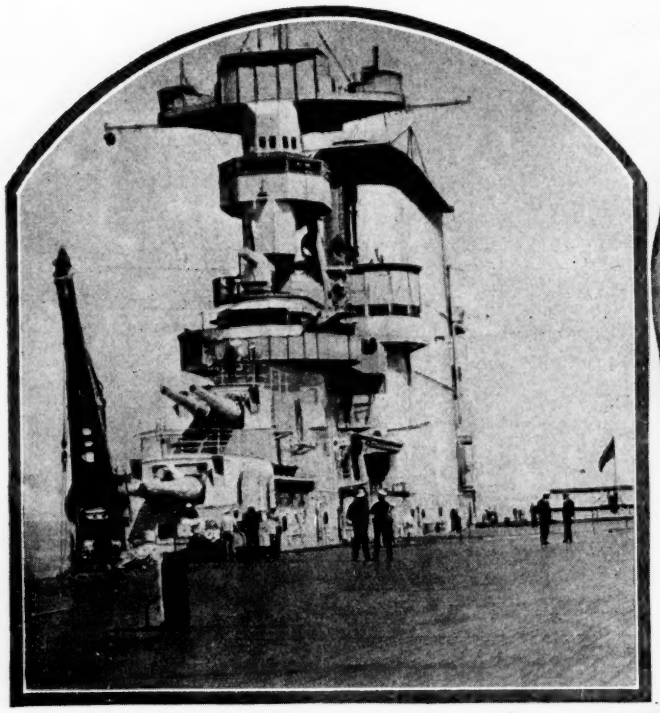
Norma's immaculate apparel is renovated in a modern laundry and cleaning establishment where employees work efficiently in well ventilated plants.

(Below)
In this hotel basement the cooks won't spoil the broth, for it is made under favorable conditions of odor and vapor removal.

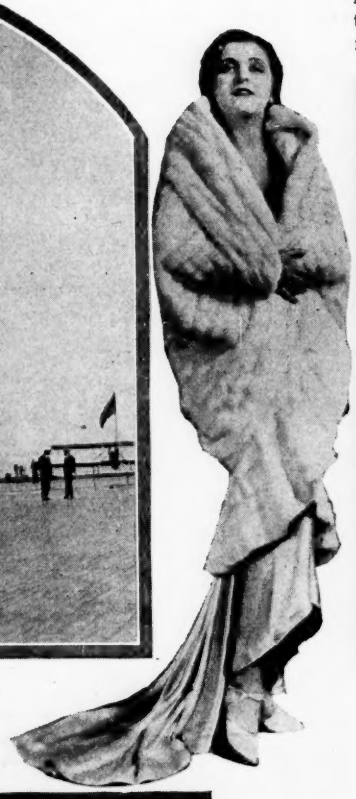


Ventilation has taken the sweat out of "sweat shops" and today the busy workers are kept contented even in the most crowded quarters.

IT COULDN'T BE DONE WITHOUT THE HE

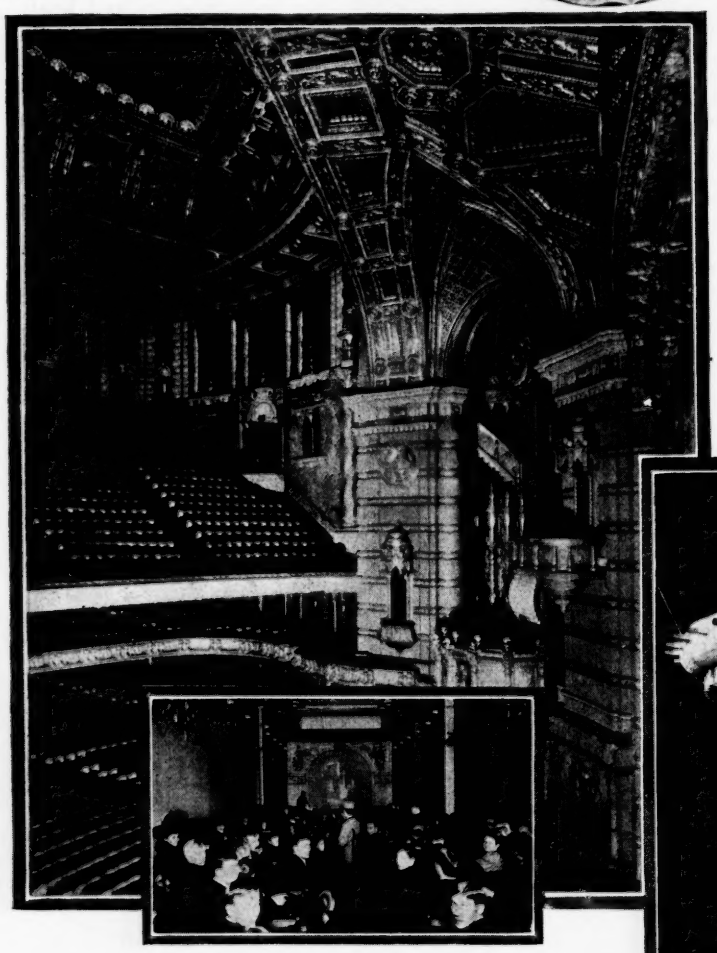


A ventilating system is part of the design of this airplane carrier. The Navy's two ammunition carriers are equipped with cooling apparatus to maintain 40° below the decks.

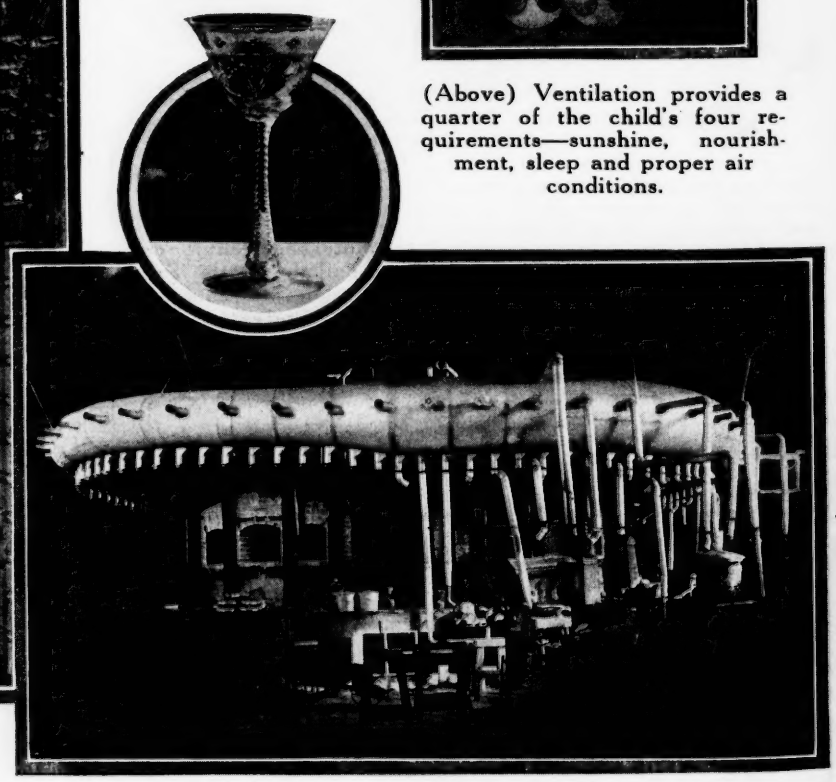


The "comfort zone" for furs is 30°. The skill of heating and ventilating engineers has been applied to the preservation of these priceless garments by the installation of means to maintain this temperature.

(Above) Ventilation provides a quarter of the child's four requirements—sunshine, nourishment, sleep and proper air conditions.



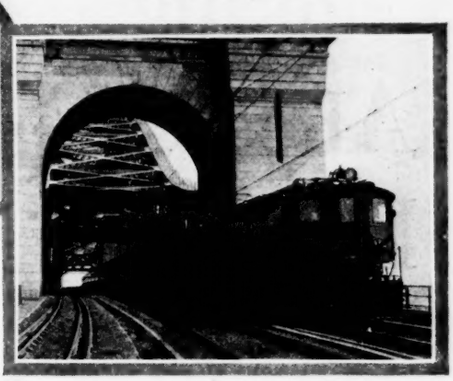
Most of the 100 million people who attend the movies every week enjoy the advantages of filtered, warmed or cooled air—a far cry from the nickelodeon of 20 years ago.

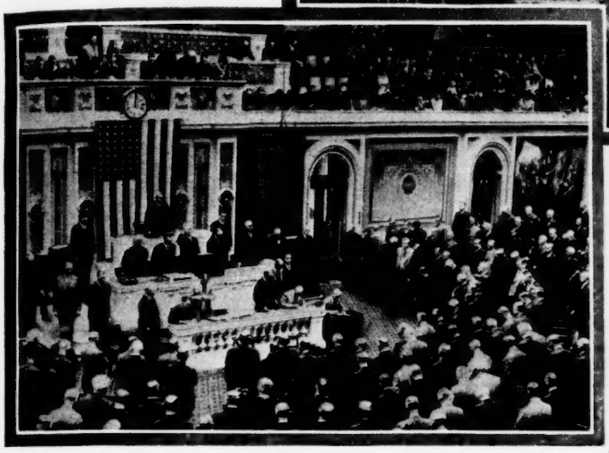


This system, so much like a centipede in appearance, may be ugly, but it cools the glass workers whose skill produces our beautiful sparkling crystal ware.

HEATING AND VENTILATING INDUSTRY

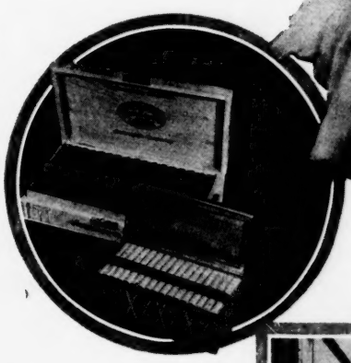
(Below) The millions of transcontinental and suburban travelers who ride in comfort each year on the electrified divisions of the steam railroads are kept warm by a service which costs nearly as much as the hauling—the steam heat supplied by oil burners on the electric locomotive.





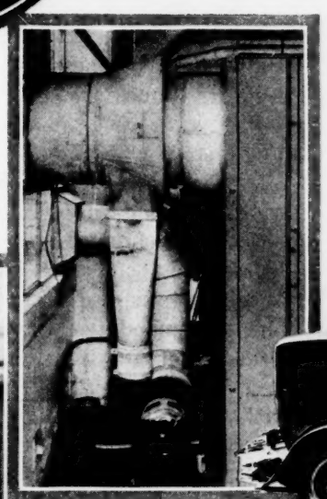
Hot summer sessions have no terror for Senators and Congressmen who transact the nation's business in the air-conditioned halls of the Capitol.

(Left) Regulated air conditions have released the feminine sex—from Sadie the Stenographer to Anita Page—from the bondage of cotton stockings. Decreased production costs of silk and rayon hose are due to humidity control in textile plants.

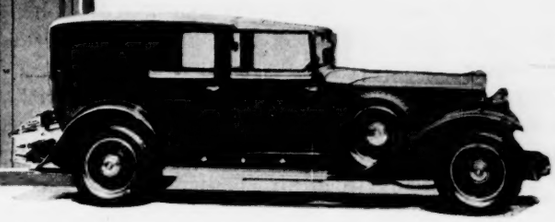


The manufacture of the one hundred and eleven billion cigarettes and six billion cigars per year requires controlled air conditions. Careful regulation of humidity is important also in milk chocolate plants where the smallest excess of moisture in the air would ruin the mixture.

(Above) Monkey mortality is decreased in the well-designed zoo where correct temperatures prevent pneumonia among the primates.

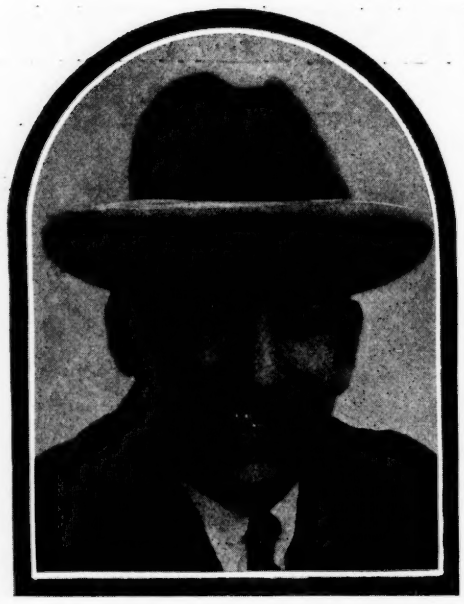


(Below) A new epoch in summer shopping was introduced when department stores adopted air conditioning, and basement bargain hunters now shop with the same comfort as those on the floors above.



Efficient dust and fume-exhaust systems supplied by our industry are largely responsible for the fine finish on the 4,850,000 passenger automobiles produced last year.

Looking Ahead In Air Conditioning . . .



by
M. G. HARBULA
Consulting Air Conditioning Engineer

AIR conditioning has a promising future. When I make this statement I refer particularly to the fact there will no doubt be newer and perhaps revolutionary developments in equipment constituting air-conditioning systems, also in the design and arrangement of equipment and methods. The cost of such systems will be materially lessened and the operating and maintenance costs will be decreased considerably.

As a matter of fact, if air conditioning is to progress materially in the next ten years it is almost essential that these factors be given major consideration by those engaged in this field.

It is estimated that approximately $15,000,000 was spent for air conditioning in 1928. This figure should have been reached ten years ago. Today it should be $50,000,000.

If one were to analyze the various applications of air conditioning making up this fifteen-million-dollar business, it would be found that a very small percentage was spent for air conditioning systems installed for *comfort* by those who desire comfortable and healthful air conditions *for themselves.*

For example, theatres spent money for air conditioning systems because it was found that patronage dropped off in summer, the public preferring the beaches, lakes, woods, mountains or their own porches to the hot, humid air in the theatre; department stores installed air conditioning systems in their basements and sub-basements when they found that shoppers did not come to their stores in summer as often or in such numbers as they did in other seasons.

In other words, air conditioning is growing each year, though much slower than it merits, because a product required it or a business would suffer without it.

Contemplate for a moment how air conditioning business would increase if Mr. Jones who, we'll say, is building a $25,000 home, would install a system which would maintain a proper degree of heat, humidity and air motion in it in winter and cool, dry air in summer. If the same Mr. Jones, off on a business trip, when he stopped at a hotel, could be accommodated in an air-conditioned room, or, if he happened to be an executive of a prosperous corporation and he desired comfort in his luxuriously-appointed offices while he handled the reins of the business during the "dog days" of summer could keep himself fit by means of air-conditioning equipment installed in his place of business. The same Mr. Jones also would pay a little higher tax on his hospital bills if he or his family could be accommodated in air-conditioned hospital rooms.

Air conditioning will grow by leaps and bounds if such applications as I describe are made economically possible, and this brings up the questions of fundamentals in design of systems, methods to be employed, new developments in equipment, simplification of apparatus, etc. Such questions can be answered only through research, education and training of engineers.

How many consulting engineers are there today who are familiar with or have sufficient knowledge and experience to design air conditioning systems and specify in detail all the elements constituting them in such a manner that reputable contractors can install them?

It is certain that if a careful survey were made one would find the number surprisingly small. Yet millions of dollars are spent for air conditioning each year and very little of it on the advice or counsel of consulting engineers or on plans and specifications prepared by them. This is rather astounding, but anyone familiar with the field knows it to be a fact.

There is a great need for engineers in this field. They must, however, be thoroughly versed not only in

heating and ventilating but in refrigeration as well. Their knowledge of all the various kinds and types of equipment constituting an air conditioning plant must be complete and up-to-the-minute. They should be familiar with various manufacturing processes and with different industries, to a degree, at least, in order that they may be in a position properly to apply air conditioning to them.

Eventually, when the number of air conditioning engineers increases, some no doubt will specialize in air conditioning for a particular group of similar or allied industries, others for theatres, department stores, banks, restaurants, homes, etc. In fact, this is the practice today with regularly established companies that do an air conditioning business; they have specialists in the different fields.

Contractors or equipment manufacturers, or both, as well as the owner, are all immeasurably benefited when a consulting air conditioning engineer is on the job. With more air conditioning engineers designing and supervising the installation of plants, the field will broaden, the business of air conditioning will increase in proportion, and newer, simpler and perhaps more economical systems or plants will be designed and installed.

Future Will See Radical Changes in Equipment

Regarding equipment constituting air conditioning systems, the future no doubt will see radical and revolutionary changes in its design and application. The production and distribution of refrigeration for air conditioning plants will, I believe, see many changes, and as a matter of fact, if air conditioning is to be universally applied and used, particularly for comfort rather than for manufacturing processes, present equipment must be revolutionized and new equipment developed.

Such comparatively recent developments as the centrifugal refrigerating compressor with its multi-tubular condenser and water cooler operating at pressures below the atmosphere were brought about by the special refrigeration requirements of air conditioning.

Designers and builders of reciprocating-type refrigerating compressors, with their accessory condensing and evaporating equipment realize fully, I believe, that, while they have been applying standard refrigerating equipment originally designed for ice making, breweries and meat packing plants, for use in connection with air conditioning plants, the latter field, growing as fast as it is, requires equipment built especially for it.

For example, consider the compressor, now designed for operation at low speeds, built for 24-hr. per day service to last for a generation, at least. This calls for large, cumbersome, space-consuming, high first-cost machinery; the drives, because of space limitations, must be direct-connected, and, if electric motors are used, it means large-frame machines which are costly and incidentally special and built-to-order jobs; the starting equipment necessarily is more expensive, larger foundations are required with its incidental cork isolation, pits, etc., all of this contributing greatly to place air conditioning in almost the luxury class, considered from a standpoint of first cost.

An air-conditioning plant with refrigeration to produce comfortable air conditions during the warm season does not operate more than 1200 hrs. per yr.; the basis is a theatre which opens at 11 A.M. and closes at 11 P.M. This is almost a maximum condition and still is not a very heavy or continuous duty and does not call for equipment designed and built to last literally a lifetime.

Higher speed, multiple-cylinder compressors, built on a unit-cylinder basis would be a real contribution to air conditioning, and I believe the future will see considerable development in this direction.

Condensing equipment is undergoing a change at the present time, shell and tube type, also multi-tubular condensers being available. While a wealth of research has been done on refrigerant condensers it is evident that refrigerating plants for air conditioning demand even more compact and efficient types of condensers.

Evaporating equipment for cooling the water sprayed in air-conditioning machines is receiving considerable attention from designers at the present time. 25 ft. long air washers, with self-contained refrigerant evaporating coils or "cooling coils," as they are more generally termed, have been replaced by equipment as little as 9 ft. in length in direction of air flow, by the use of specially-designed coils built on the principle of quick-steaming high-pressure boilers. This development alone will result directly in lower first costs of plants when production of such coils will be on a quantity basis, and, incidentally, the lesser space required will be a contributing factor towards overcoming some of the obstacles of an owner in adopting air conditioning.

Welding Is Simplifying Maintenance Problems

Refrigerant piping systems are being simplified considerably, welding is more generally used even to the extent of welding fittings and valves in the lines, thus tending to minimize leaks in the refrigerants, which is one of the "maintenance" bugbears of refrigerating plants.

Methods of distributing cooled air will, no doubt, be revolutionized; present systems of distributing air through large, space-consuming sheet-metal ducts at 1000 to 1500 ft. per min. velocity may give way to new ideas of forcing air to its point of use through pipe made of steel, wrought-iron, etc., at steam pipe velocities of 5000 ft. per min. or more.

There is a great deal of development work now going on along the lines of unit air conditioners. Such equipment has its place in the field of air conditioning, just as the "central system" of air conditioning has, each having its advantages for application to a particular problem.

The conditioning of air for comfort in homes, offices, small stores, etc., is not so far in the future in so far as its general application is concerned. A central plant system for the home will require a compact, efficient, comparatively noiseless refrigerating unit. The individual office and also the small store and other isolated rooms will probably call for a unit air conditioner functioning to produce predetermined air conditions with a self-contained refrigerating unit.

Summarizing, it would seem to me that the next ten years will see more

developments in air conditioning than all the years since the inception of the science. Make-shift equipment and methods, that is, equipment originally designed for use in other fields and adapted to air conditioning, will give way to equipment and methods specifically designed for air-conditioning work.

Heating and ventilating engineers will acquire a thorough knowledge of refrigeration and similarly refrigerating engineers, of heating and ventilation. They will combine these arts into the science of air conditioning and thus make themselves available as air-conditioning engineers.

(*Continued from Page* 22)

fuel, as compared with the heavier oil.

Question: What fuel will be used in domestic heating plants in the future?

Mr. Haslam: That is a little hard to say. It seems to me that automatic heating will continue to grow in popularity and that the present trend towards installation of domestic stokers for coal and the further use of automatic oil and gas burners will continue. While from the standpoint of convenience, gas-burning rates first, oil-burning second, and coal-burning last, the relative costs of gas, oil, and coal are in the same order, and, therefore, the relative use of each of these in the future will largely depend upon the price trends of these fuels and the willingness of the public to pay a premium to secure added convenience.

Question: How can the cost of oil burners be reduced?

Mr. Haslam: In three ways—(1) by improved marketing distribution, to cut down the gap between the cost of a burner at the manufacturer's plant and the cost of the same burner installed; (2) by high-grade installation work, to reduce the allowance which has to be made for servicing, which in turn will lower sales resistance and reduce marketing costs; and (3) greater use of the smaller sized inside tanks, particularly in districts where there is good delivery service by oil companies.

Question: What are the biggest problems in the oil-burner industry today?

Mr. Haslam: One of the sore spots in the industry as it stands is that there is too large a differential between the manufacturer's cost of the burner and the price the home-owner must pay. The second is the poor quality of many of the installations, which causes a great deal of dissatisfaction. It is entirely possible that this second matter is the cause of some of the additional cost added to the oil burner.

Even with good oil burners—and there are a large number of good oil burners being sold today—there are too many poor installations.

As an example of the trouble caused by poor installations, I recently heard of a manufacturer who had a representative handling only the metropolitan district, while another dealer took care of a large part of the suburban business. While the metropolitan dealer was doing a large business and operating at a nice profit, the suburban dealer was having so much difficulty with servicing that eventually it overwhelmed him. The metropolitan dealer, who took over his business, at once began a systematic overhauling of all the suburban burners the other dealer had installed and eventually got them in first-class condition. This dealer is now handling all of the business in the New York district and his servicing is all being taken care of by one man.

Question: What can be done to improve the quality of installations?

Mr. Haslam: First of all, the use of careful workmen only, trained to follow instructions, with adequate supervision by a thoroughly competent installation boss who will see to it that the installation is satisfactory before leaving it. In addition, I have always felt that no domestic oil-burner installation should be left without first determining the per cent CO_2 in the stack gases by the usual simple flue gas analysis. There are two reasons for this—(1) It is an easy way of saving 10% of the fuel; and (2) It tends to show whether the burner is installed satisfactorily, because if the burner cannot carry the load with the proper per cent of CO_2 then there is probably something faulty in the furnace or burner setting which will give trouble later.

Question: Do you foresee any radical changes in the design of oil burners in the future?

Mr. Haslam: Many new developments are taking place and it is entirely possible that there will be radical changes in the future. The main features needed at present are greater reliability and efficiency. However, it is possible that the oil burner of the future will not be an oil burner at all, but a gas burner—and yet still be an oil burner. For example, liquefied gases such as propane are now being sold in containers. Propane has a heating value ranging from 2500 to 2700 B.T.U. per cu. ft. When the pressure on the liquid is released, the liquid gasifies, and can be burned without mechanical treatment.

Consequently, propane may become a powerful competitor of gas in some places, and it is possible that containers of this material will be used in the domestic heating plant so that nothing more will be necessary than a container of liquefied gas, a burner and a few controls, such as are necessary with gas installations at the present time.

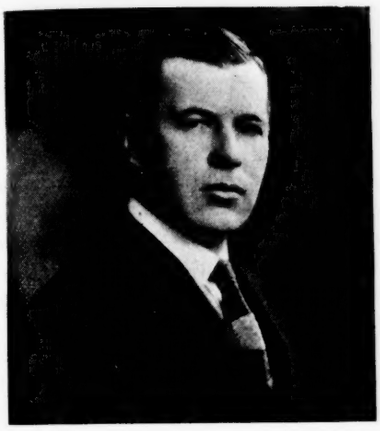
Question: In your opinion, would this ruin the oil-burner industry?

Mr. Haslam: I can best answer this question by drawing an analogy between the oil-burner industry and the street car companies. Years ago when the buses and trucks first began to give the electric cars severe competition, the street car companies attempted to eliminate the motor truck and bus competition by litigation. In the meantime the electric lines were losing a great deal of business, and in the end many of them took over the truck and bus lines. As the matter now stands, street car companies believe in and foster the idea that they are in the transportation business and not in the electric car business. The owners do not feel that they are running street car lines, but that they are furnishing all kinds of transportation to the public, whether it be on steel wheels or rubber tires.

In other words, I think the up-to-date oil-burner company realizes that it is in the business of automatic heat and not only the manufacture of oil burners. If, and when, changes take place in the characteristics of the devices necessary to give automatic heat, these companies will merely change the characteristics of their products and continue to meet the demand for automatic heat.

Air Cooling Equipment Needs Development

by S. C. BLOOM
Consulting Engineer



AIR conditioning in industry for the provision of suitable atmospheric conditions to aid production or its quality has reached a fairly high stage of development, but it seems to me that the great field which lies open for the future is the provision of comfortable conditions in office buildings, mercantile establishments, hospitals, etc.; in fact, in every type of structure which is populated to a fairly high degree.

The success which has attended the cooling of many theatres, hotels, and restaurants, a smaller number of department stores, and office buildings has focused public attention upon the fact that comfortable conditions can be had the year round.

Creation of a public demand for this sort of thing greatly facilitates the practical application of means for producing these conditions. The principal resistance has come from those who must supply the capital for investment in the facilities needed. With existing methods and apparatus, the initial outlay and operating expense have appeared to be excessive, but upon analysis, it can almost invariably be shown that, even on the basis of present-day costs, investment in air cooling equipment will pay handsome returns.

The comparatively short operating period wherein air cooling is required strongly indicates the necessity and desirability of building equipment consonant with a reasonable life under the circumstances of operation. Unfortunately, at the present time, there is nothing which approaches the ideal refrigerating machine for this particular duty, but it may confidently be expected that in the very near future the needs of the situation will be supplied.

A notable let-down in productive effort which accompanies excessively warm weather is a fact which is apparent to every one. The elimination of this tremendous economic loss is an alluring problem for the air-conditioning industry, and it would receive the thanks of a nation in its achievement.

(*Continued from Page* 23)

sion units could not be expected to give the high efficiencies obtained in heating plants designed solely for the use of gas. Research has shown the absurdity of such a claim. For many years to come the ideal heating plant will be one in which solid, liquid or gaseous fuel can be burned at the will of the consumer. That does not imply any doubt as to the retention of gas-fired equipment when once installed, but since at least equal efficiency can be had with a conversion unit, such an installation permits the consumer to have the satisfaction of not feeling tied to any particular kind of fuel.

This is of considerable value where changes in ownership of houses are likely to occur as it relieves the owner of having to sell a specific fuel in addition to real estate. Nor can contractors in the heating trade be expected to sell only gas-designed boilers and furnaces. Heating engineers have not, in the past, been eager to advise their customers regarding their choice of fuels. Now that well-designed and well-built gas conversion burners are on the market the continued sale of furnaces suitable for solid fuels cannot be taken to mean the loss of potential customers for the utility companies.

It should not be construed from the above that the use of gas is likely to be limited to conversion units. There is a great and growing demand for the highly efficient furnaces built solely for gas fuel, and these will undoubtedly play their part in building up the heating business of the gas companies. But the lower cost of conversion jobs coupled with their high efficiencies will bring gas heat within reach of the multitude who could not be induced to invest in an expensive heating plant. The fact then, that the gas industry is now prepared to install gas-fired equipment in existing heating plants is a factor which should have a tremendous effect on the sale of gas for house-heating purposes and naturally induces optimism when we attempt to scan the future.

Further encouragement for the gas industry in the sphere of house-heating also is found in the great interest now shown by boiler and furnace manufacturers in the use of gas in equipment built by them. In the past, heating engineers have devoted their efforts to improving the means of conveying the heat from the point of generation to the space being heated and little attention was given by them to the value of the various fuels which could be used. It was, of course, assumed that gas could not compete with solid fuels. Now we find a very active spirit of cooperation between the manufacturers of heating plants and the gas industry and many of the former are redesigning their furnaces to make them more efficient with gaseous fuel while still being suitable for use with solid fuels.

The growing interest displayed in the proper insulation of buildings may also be mentioned as another factor tending to popularize the adoption of gas heat.

In summation, we believe that house-heating by gas will make rapid strides in the coming years and that gas as a domestic fuel will be in general use ten years hence not because people wish to conserve natural resources, not because of the desire for smoke abatement, but rather on account of the desire of every householder for a system of house-heating which will be wholly automatic and yet entirely reasonable in cost.

That service the gas industry can offer to practically all of its customers.

Year Round Air Conditioning

A Probable Development in the Home Service Rendered by Gas

By Eugene D. Milener
American Gas Association

WHEN considering house cooling as it will be practiced in residences during the next decade, the gas industry visualizes this as a logical development in its plans to furnish the major energy requirements of the American home. This application of energy is simply one more step in the growth of the American home, and this progress will continue to take place until the home is equipped with every possible comfort and every possible labor saver which can be produced by mechanical forces. And this energy will be supplied automatically from sources outside the house.

House cooling is simply a service depending upon energy to change the humidity and temperature of the air supplied to the various rooms, the same as properly heating a house is simply changing the temperature and humidity. In the one case a definite number of heat units—energy—is required to raise the temperature and absorb moisture for humidification, and, in the case of cooling, a definite number of heat units (although they are used differently) are required to bring down the temperature of the air and remove the excess moisture that it contains.

Looked at from this angle, it is well to consider the present status of the various factors that have a bearing on the ultimate development and public acceptance of house cooling with gas; the trends these factors are taking and the position the whole movement is likely to occupy the latter part of this decade. The factors affecting the growth of gas house-cooling can be roughly placed into two general classes—the social, financial and economic factors, and the technical research and engineering factors. In the first class are public acceptance from the viewpoint of comfort, luxury and health, changing living habits, financial standing of users, construction of buildings, etc. In the second class may be included the necessity for development of cooling and dehumidifying equipment and especially the media that will be used for these operations, control apparatus, safety devices, and so on.

Every trend in the modern high-grade home is very definitely lending itself to preparing the way for house cooling. The public has put its stamp of approval on every worthwhile improvement in the home. It has accepted comfort and luxury as the birthright of every one, and places no restrictions around those who shall share in them. Anything that helps to better the health of individuals or of groups of individuals is accepted without question. The individual home-owners have in large numbers found ways of financing every other comfort that has been produced, and large numbers of the public will be able to finance house cooling.

Building construction is already well advanced in applying wall and ceiling insulation. Weatherstripping is accepted everywhere and storm windows in some sections are used as a matter of course. And last but not least, automatic gas house-heating has been introduced into thousands of homes where the owners are daily experiencing the pleasure of uniform temperatures controlled and delivered noiselessly and efficiently through gas pipes under ground. This "winter air conditioning" is at the beck and call of a little thermostat that hangs on the wall or rests on a table. The owner only sees this once a week when he winds the clock; but now with self-winding clocks even that simple ritual has been done away with.

So it can be seen that the development of gas house-cooling is in line with what people want, what they expect and what they will be demanding within a few years.

We in the gas industry believe that gas will play a prominent part in supplying the public with this service in much the same way that it now supplies the home with all the other services that require large amounts of energy. It is estimated that the average modern home of about eight rooms requires about 210,000,000 B.T.U. a year in the form of gas for house-heating, cooking, water heating, refrigeration, etc. This compares with about 2,000,000 B.T.U. a year in all other forms for lighting, household power and other miscellaneous uses. It has also been estimated that such a house would require about 21,000,000 B.T.U. a year for house cooling. This would be but a small percentage increase in the gas used and can be delivered without one cent additional investment on the part of the gas company.

Since all gas used for house cooling is off-peak energy, it will be available at attractive off-peak rates when its use becomes general. On the other hand, the automatic de-

livery of this large amount of energy in any other form would require the investment of immense sums, handicapping the house cooling system with burdensome fixed charges from the beginning.

This brings the subject of house cooling with gas down to a question of efficiently utilizing the automatically delivered cheap energy that is already available in every urban home.

The technique of house cooling with gas is rapidly becoming understood. Research is now under way to determine the fundamental factors with greater accuracy and to develop mechanical equipment and cooling media that will be reliable and can be operated simply. Research of this character has the endorsement of the American Gas Association acting for the gas industry, and the Executive Board of that organization has instructed the Committee on Industrial Gas Research to lend every encouragement to its energetic prosecution.

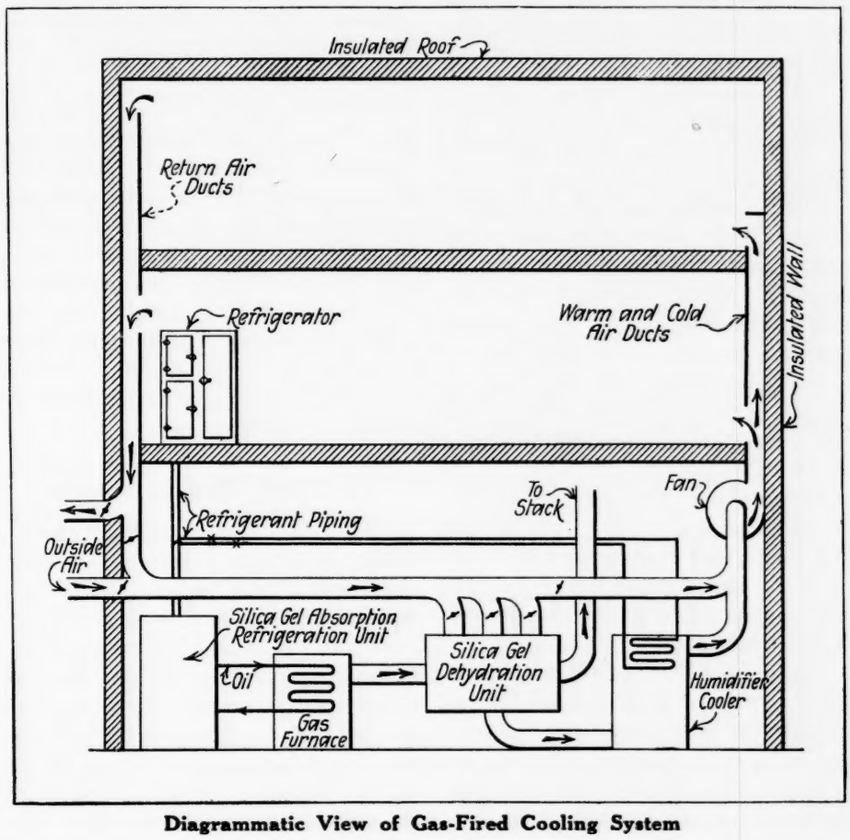
At the present time progress in this field has been based largely on work that is being done in commercial air conditioning. It should be borne in mind that cooling the reduction in sensible heat of the air, will not in itself condition air satisfactorily for summer conditions. Dehumidification, or the removal of moisture is of equal or greater importance. The progress made in gas air-conditioning up to this time is attributable to the fact that this process can be done directly by energy utilized in the form of heat. Installations using gas as the source of energy for air conditioning have been made in many industries, and some have been in service long enough to show the fundamental soundness and great economy where the cycle is operated by gas heat. These successful factory installations have been supplemented by a large theatre installation. The cooling of this theatre with gas is just one of the many steps that will be taken ultimately to give the householder a gas cooling system that will supplement and tie in with his gas heating system.

Greatest progress in gas air-conditioning using gas burners as the source of energy seems to have been made using silica-gel as the absorbing medium. Its tremendous absorbing qualities, its freedom from chemical reactions and its ability to be rapidly heated with a gas flame makes possible through its use either direct air conditioning, or air conditioning from refrigeration produced by it. Or there may be any combination of the two.

Just what form household gas-cooling equipment will ultimately take cannot be stated now. All authorities seem to agree, however, that the distribution system through the house will be by means of air ducts with positive circulation. This lends itself very nicely to combination with an automatic warm-air gas heating system or winter air conditioner. One such combination system that has been suggested is shown in the accompanying drawing. It shows how it is possible, with one gas burner, using silica-gel dehydration and refrigeration units and an ordinary air washer, to completely air-condition the home throughout the year. Refrigerators of any size can also be cooled from the same gas burner.

The furnace supplies the heat necessary for the refrigeration unit by means of circulating oil. The combustion gases from the furnace pass around the gel containers in the dehydration unit, thus heating the gel. A portion of the recirculated and fresh air passes through the hot gel which serves as a heater during winter operation. For summer operation, this air will pass through only those sections of the dehydration unit which have been previously activated or heated. The unit will then serve to dehydrate rather than to heat. Household refrigeration can be operated from the same gel units.

Other plans have been proposed that depend entirely upon the air being dehydrated by a gas absorption refrigeration machine and cooled down to any desired point by dehydration. Ultimately research will no doubt develop several systems, and experience gained from practical operating conditions will determine which system will best meet any given set of conditions.



Diagrammatic View of Gas-Fired Cooling System

That year-round automatic air conditioning will be somewhat commonplace in the better class of homes in less than ten years from now is almost a surety. Automatic heating and winter conditioning by gas is now the accepted standard. The next step—dehydrating and cooling—is now entering the research and development stage.

(*Continued from Page* 24)

without disturbing the remainder of the system or, in new homes, it may be installed as a complete system.

Thermotrol—Kilotrol System

The Thermotrol consists essentially of an electric heater enclosed within a copper fin type radiator, a water tank for humidifying the air and thermostatic control, all assembled within an art metal case equipped with ball type casters for ease in moving. Above the radiator is a triangular shaped tank, open at the top, to hold the water used for humidifying purposes.

Below the radiator is located the room temperature thermostat, while attached to the top of the copper fins is another thermostat for controlling their maximum temperature. This is set to cut off the current at 250° F. The room thermostat may be adjusted by means of a lever extending through the front of the case, to any temperature between 40° and 80° F.

Convection currents set up by the heated radiator draw air from the floor through an opening in the bottom of the case and carry it upward over the heated copper fins. Before being discharged from the front of the case, the warm air passes along one side of the triangular tank and gives up some of its heat to the water within. The vapor thus produced is carried out in the air stream and humidifies the atmosphere. Experience has demonstrated that by this means a relative humidity of approximately 50% is maintained.

Heater capacities of 1½ kw., 3 kw., 4 kw. or even greater may be installed within a given unit, depending upon the amount of heat required. The heaters are designed for operation at 220 volts.

Thermotrols are known as master units. In multiple with these may be connected one or more auxiliary units which differ only in the absence of the thermostats. The operation of the auxiliary units depends upon the control of the master unit to which they are connected.

The Kilotrol is the device by which the maximum demand is controlled. This is accomplished by taking advantage of the heat storage in the Thermotrols previously heated, to permit the connection of other groups of Thermotrols requiring additional heat. It is, essentially, a motor operated, six-circuit switch. To each circuit may be connected a group of Thermotrols, the number depending upon the size of the house and the heating requirements. The greatest number of units connected to any one circuit will determine the maximum demand of the system.

In operation, the Kilotrol connects each group of Thermotrols successively to the supply lines. As one group is brought up to temperature, the switch is rotated to the next group. If this group requires no heat, the switch rotation continues until the thermostatic control causes it to stop on a section requiring additional heat. When all the units are up to heat the main contactor will automatically open and so remain until more heat is called for by one of the groups.

Since January, 1928, when the first Thermotrol-Kilotrol system was installed, excellent results have been obtained from this system, although from the experience gained a number of improvements were made which are incorporated in the equipment now on the market. During the past summer several installations were made in the Philadelphia district upon which tests are being made by the power company.

Hallmark Heating System

The Hallmark heating system takes advantage of the heat storage characteristics of water. The heater consists of a large, well insulated, steel water tank equipped with standard immersion type electric heating elements, the voltage of which can be made to suit the requirements of the electric company. It may be installed in the basement in place of the furnace, or other convenient location. The water in the storage tank is heated to about 250° F. during the night or other time designated by the electric company, and the heat so stored is given up as required for heating the home.

This system adapts itself readily to the equipment already installed since it may be used in connection with a warm-air system or radiators having return piping. When radiators are used, the hot water from the storage tank is circulated as required, through the coils. For a warm-air system, it is used to heat the air which is forced through the building.

An electrically operated water pump is installed for circulating the water through the radiators or, in the case of a warm-air system, a power blower is installed to maintain air circulation. In either case, the motors are operated automatically by a thermostat in the living quarters, set for the temperature to be maintained. In this manner the stored heat is given up only as required.

A time switch controls the power supply, cutting it on and off at predetermined times as established by the power company. In addition, a thermostat is installed in the water tank which shuts off the power when the required temperature is obtained. Except during extreme weather conditions, the proper water temperature will be reached considerably before the time switch would open the power circuit; hence the water thermostat acts not only as a temperature limiting device but also to secure maximum economy in the use of power.

The size of the storage tank will depend upon the volume of the space to be heated as well as upon the atmospheric conditions to be met. The connected load of the heating elements will be determined by the volume of water to be heated and by the maximum time allowed by the utility for this purpose.

For several years Hallmark heating has been operating with very satisfactory results in a group of homes in Fort Wayne and vicinity. More recently a number of installations were made in the Philadelphia area.

In any system of electric heating careful consideration should be given to the insulation of the home against heat losses. Material is now available that may be applied to a house already constructed or for installation during construction.

An idea of the economy to be derived from proper insulation is shown in Table I. The results here recorded were obtained from the house shown in the headpiece. After the electric heating system had been installed for 27 days the house was thoroughly insulated. A comparison of the requirements during this period with

(*Continued on Page* 40, *Column* 1)

TWICE *the* POWER

MEANS CUTTING COSTS IN HALF

CHARAVAY
PROPELLER TYPE FANS

Model shown above is single propeller four point suspension Charavay Fan, with patented overlapping blade.

Fourfold Efficiency of Charavays Proved

The Woonsocket Rayon Co. are using eight 54 inch 5 HP Charavay Fans on the cooling tower shown here. This is only one-half the power formerly used on a tower of the same size and capacity in gallons of water per minute. The improved results are better than four-fold—for Charavay's double strength provides air at half the former cost, *plus one inch more vacuum* than was estimated. (Installation by The Cooling Tower Co., New York—at a cost far less than other fans would permit.)

The *Overlapping Blade* Does It

Charavay's overlapping blade is the result of its inventor's background of aeronautical engineering. And too, Fred Charavay's *recognized* skill in propeller design makes certain the most efficiency possible from the propeller, plus the patented overlapping blade that *only* Charavay Fans have.

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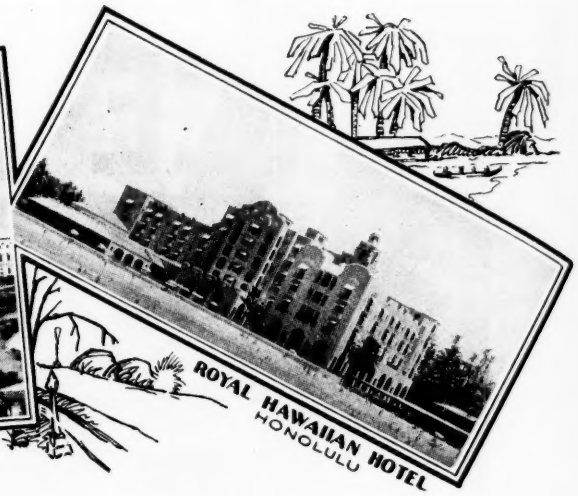

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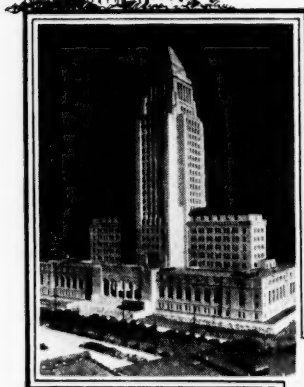

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towards a definite goal has placed us in a unique position with regard to our customers.

¶ The goal has been — the highest possible grade of sound engineering in Heat Transfer Equipment.

—With a trained and experienced Engineering Division

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—and a national system of representatives backed up and knit together by five District Offices

we can render to our customers the greatest measure of intelligent cooperation.

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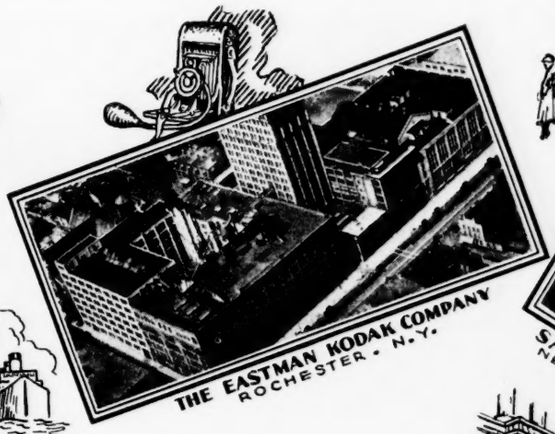
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are shown by the accompanying views of a few prominent plants and buildings using Whitlock Heat Transfer Equipment.

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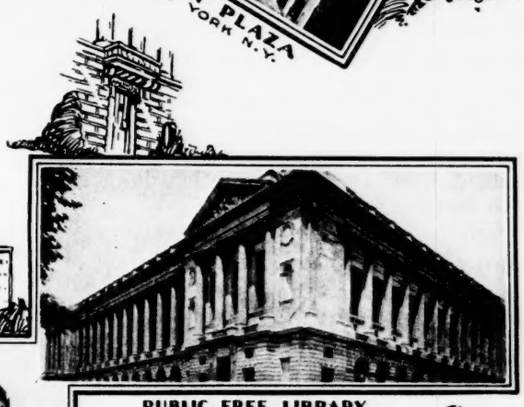
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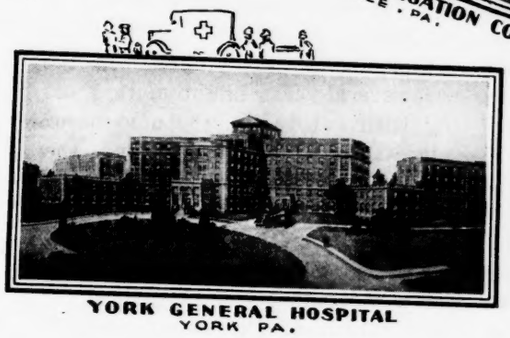
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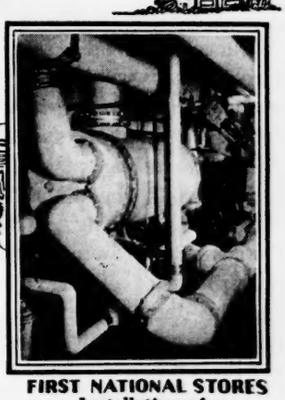
FIRST NATIONAL STORES
Installation of
Whitlock Convertor

(*Continued from Page* 36)

a similar period immediately following the addition of the insulation is an indication of its effectiveness.

TABLE I

Effect of House Insulation on Heating Economy

Twenty-seven days before insulation:	
Total kw. hour consumption	3650
No. of degree-days	950
Average kw. hours per day	135.1
Average kw. hours per degree-day	3.84
Twenty-seven days after insulation:	
Total kw. hour consumption	2020
No. of degree-days	994
Average kw. hours per day	75
Average kw. hours per degree-day	2.04

Reduction in power consumption due to insulation, 44.5%.

Some of the outstanding advantages of electric house heating are:

1. As reliable as the power supply to electric lights.

2. Entirely automatic in operation.

3. Due to absence of flames or gases the system is absolutely safe.

4. There are no products of combustion to pollute the air.

5. It is clean. No soot, dust, ashes, or oily vapors, to circulate through the atmosphere and collect on draperies, wall paper and furniture.

6. Any desired temperature can automatically be maintained.

7. Electric heat is 100% efficient. All of the heat units in the electricity are converted into useful heat.

8. Heat is available instantly at the turn of a switch. This is of value in the spring and fall and during cool periods in the summer.

9. An electric system compares favorably in installation cost with a thermostatically controlled steam system.

10. Basements, chimneys and fuel storage space can be eliminated.

What of the Future?

Success already attained by the two systems just described and the recent prominence given to the subject by a number of periodicals, has focussed public attention as never before upon the advantages of electric house-heating. There are evidences of a growing demand for this new phase of electric service. How far the demand can be satisfied depends in no small measure upon the ability of the electric companies to establish economically sound rates which are at the same time low enough to encourage the development of this load.

The possibility of increasing the domestic load from the present average of approximately 600 kw. hrs. per meter per year to from 15,000 to 50,000 kw. hrs. where electric heating is installed is certainly alluring. A number of electric companies is studying the subject at the present time and several have established special rates to encourage additional installations from which operating data may be accumulated. It is too early to predict the answer but one may rest assured that the development of a load of this magnitude will not go unchallenged.

(*Continued from Page* 25)

Domestic stokers have modernized anthracite, and made it automatic. The successful stoker not only modernizes the heating plant and insures even temperature, without smoke, soot or odor, but is exceedingly economical.

The anthracite stoker has not been developed haphazardly. A great deal of money has been spent in perfecting and bringing the stokers to their present high standard of efficiency. One stoker company maintains a very extensive laboratory where various types of boilers, stoker-equipped, are under fire continuously for the purpose of further perfecting the machine. Such laboratories safeguard the best interests of the consumer.

Thousands of stokers are in successful operation, not only for heating homes, which range from bungalows to mansions, but for hot water supply, for bakeries, vulcanizing plants, candy factories, hat factories, restaurant ranges, steam tables and for many other purposes. The domestic anthracite stoker is no longer an experiment; it has proven its right to be considered wherever modern automatic heating efficiency is required.

Considering the progress in the past several years in automatic heating with anthracite, the amount of interest in this subject, and the amount of research which is now being carried on, the further development of automatic heating with anthracite is assured. To what extent that development will be carried, or along which of the many possible lines it will be carried, or how the development will affect anthracite in the future, is entirely problematical.

A stoker has now been placed in operation in limited numbers which combines the stoker and furnace in one unit and is admirably adapted to new homes. A few installations have also been made to date of stokers whose hoppers are fed from overhead bunkers, somewhat along the lines of the condition depicted in the accompanying illustration. Architects are daily giving more attention to the utilization of space in the cellar for recreation rooms, lounges, etc., and the anthracite stoker is admirably adapted to such construction.

Various inventors are now at work designing and planning ash-removal devices, some of them based on the vision of removing ash mechanically or pneumatically from the ashpit to a point outside the building where it may be deposited in ash cans. To date, however, such development is in theory only. One inventor, to our knowledge, has used, in his own home, a pneumatic conveyor to carry coal from the bin to the magazine of a magazine-feed boiler.

Developments are being carried on from numerous angles, all of which indicate that anthracite is splendidly adapted, through its inherent characteristics, to the automatic heating which is being developed and fostered.

Cooperation

The pictorial displays in this issue, Pages 26-29, were made possible by the splendid cooperation of the following organizations:

Anthracite Coal Service, New York
Benson & Hedges, New York
Bon Marche Department Store, Seattle, Wash.
Brown Bros., New York
Carrier Engineering Corp., Newark, N.J.
DeVilbiss Co., New York
Ewing Galloway, New York
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"Laundry Age," New York
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Metro-Goldwyn-Mayer, New York
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New York, New Haven & Hartford R. R., New York.
Otte Bros. American Laundry, Detroit, Mich.
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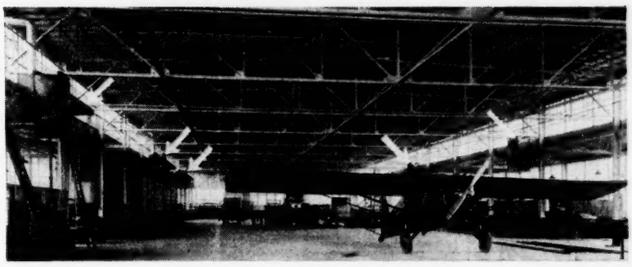
CONSIDER HEATING COSTS!



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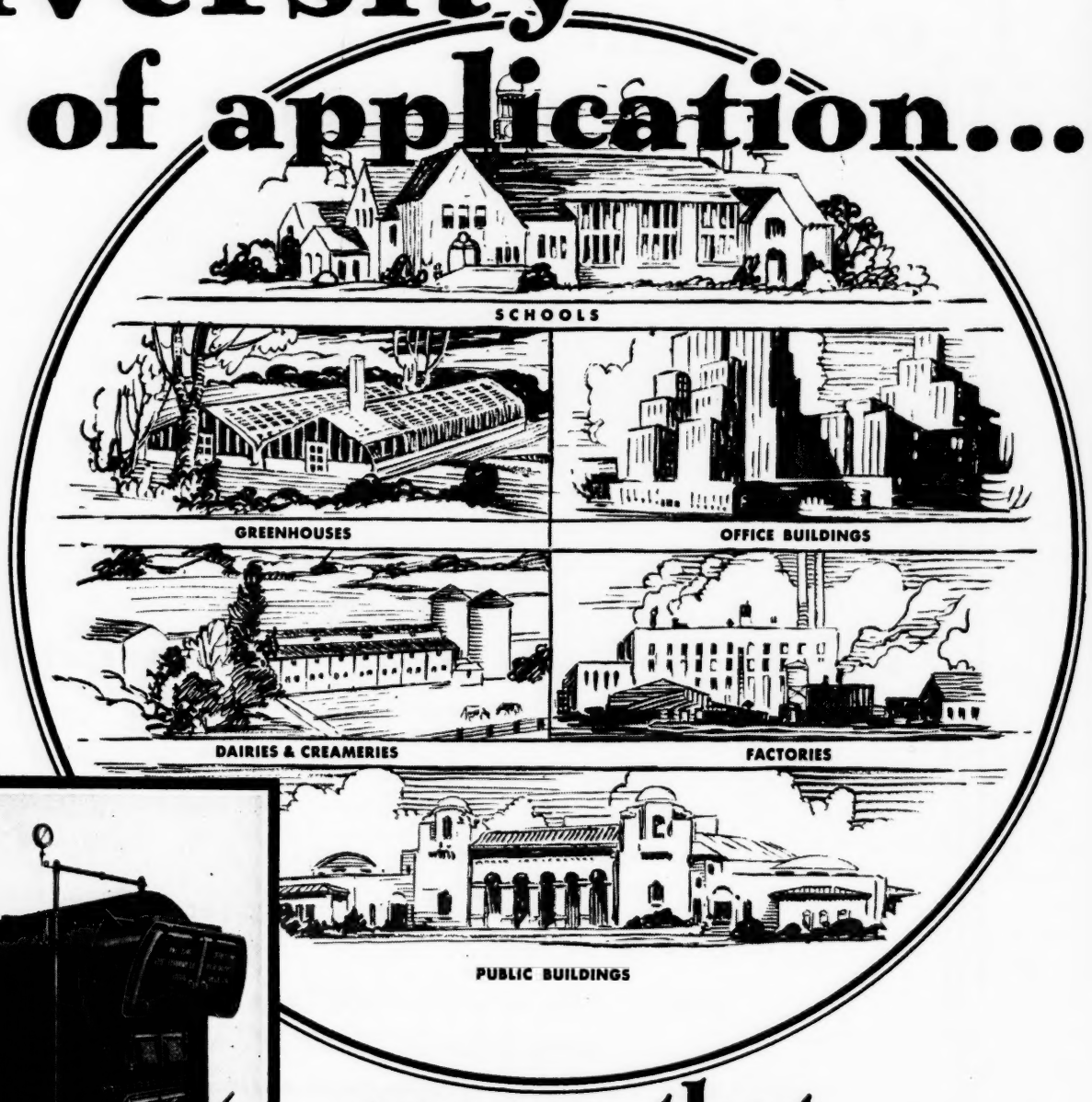

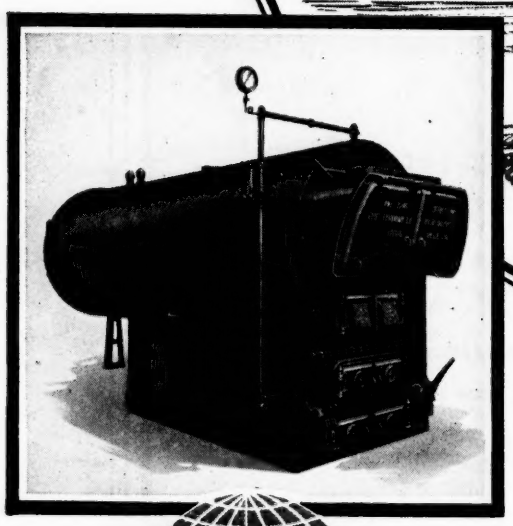

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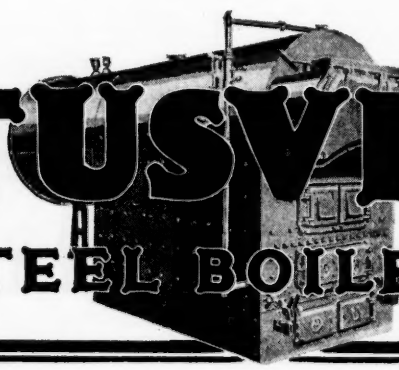
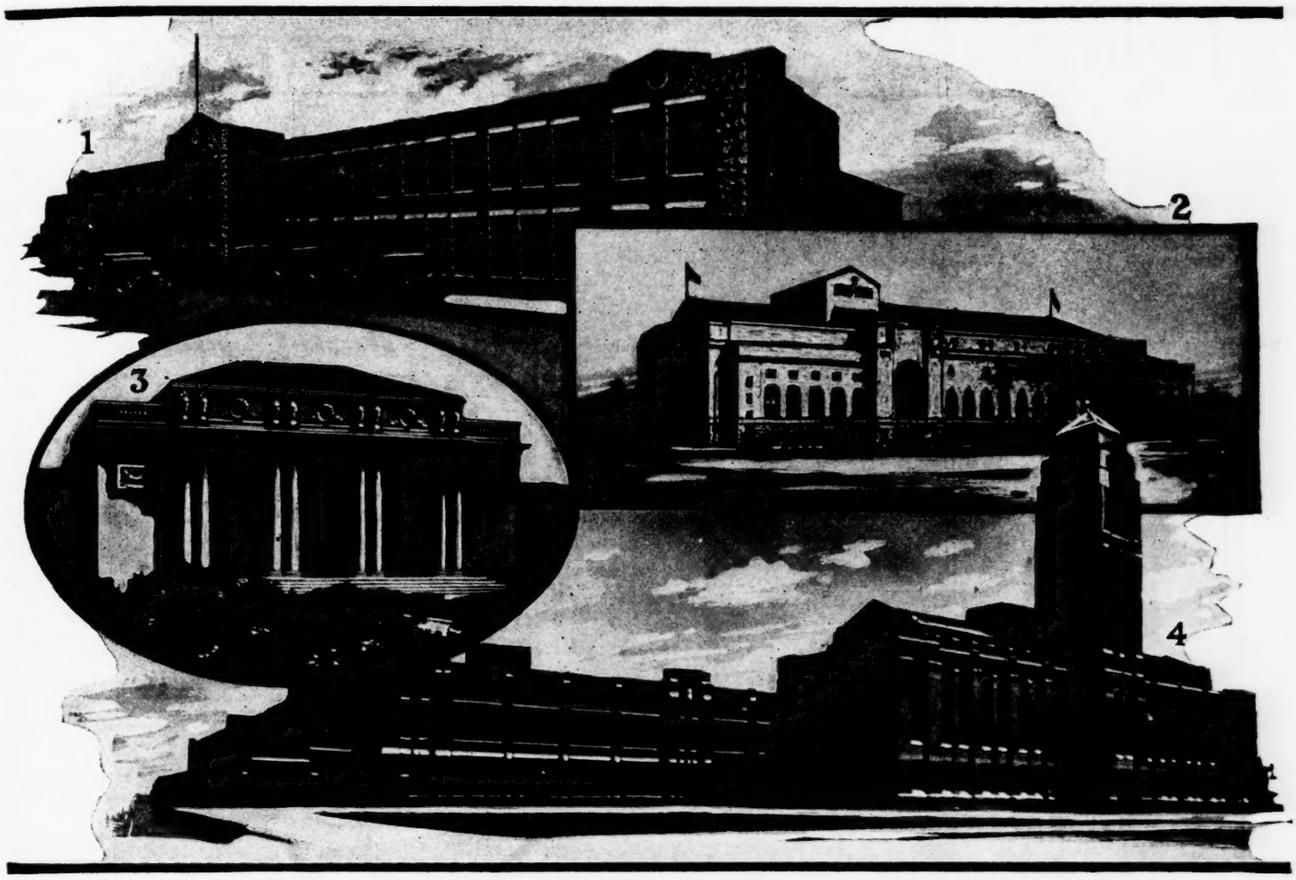


TITUSVILLE
STEEL BOILERS

TIW-17



1—The Ruralist Press, Atlanta, Ga. Lockwood, Greene & Co., architects and engineers; H. M. Jackson & Co., heating contractors

2—Municipal Auditorium, Minneapolis, Minn. Croft and Boerner, architects and engineers; H. Kelly & Co., heating contractors

3—Campbell Union Grammar School, Campbell, Calif. Mr. Wm. H. Weeks, architect; Leland and Haley, heating engineers; Mr. Carl T. Doell, heating contractor

4—The Kelvinator Corporation Building, Detroit, Mich. Smith, Hinchman & Grylls, architects and engineers; Johnson, Larsen & Co., heating contractors

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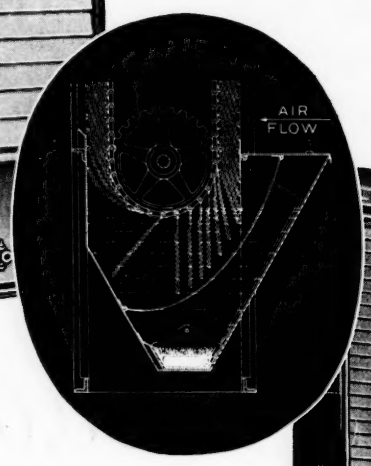
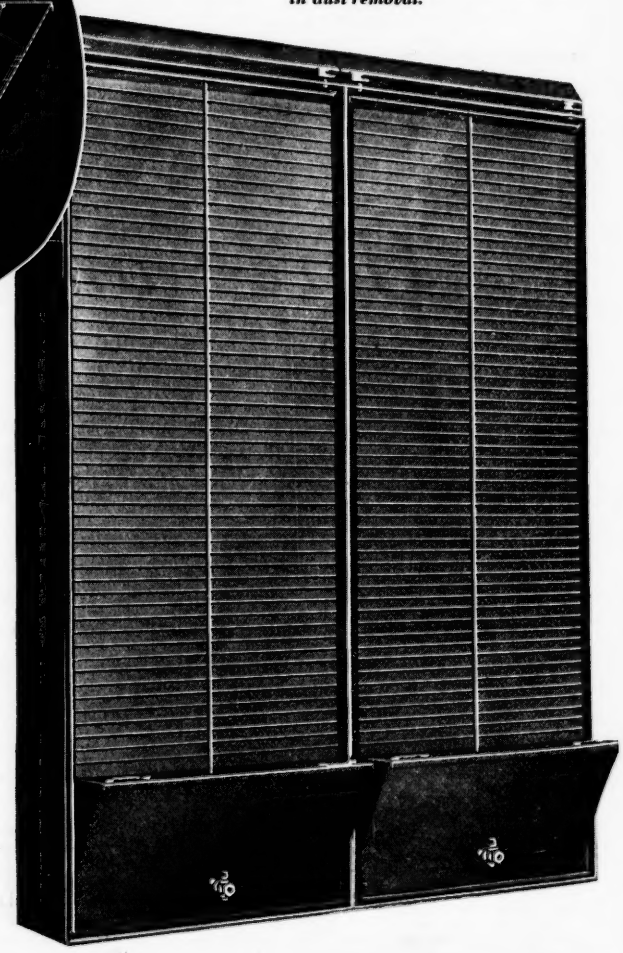
The "Panel" Filter for Intermittent Service

THE Venti-Panel filter brings to modern ventilation the same air-cleaning and self-cleaning principles which have proven so successful in the Multi-Panel filter. Both filters are identical in construction with one exception—the Venti-Panel has fewer panels in its filter curtain to conform with the resistance characteristics allowable in ventilating practice.



The closely overlapping screen panels form a dense filtering curtain, in the air stream, having maximum efficiency in dust removal.



THE Multi-Panel air filter was originally developed to meet the severe operating conditions and exacting air cleaning requirements of steel mill service—recognized as the most difficult air cleaning problem—and being designed for the worst condition makes it a better filter for any application.

Multi-Panel Air Filter

The "Panel" Filter for Continuous Service

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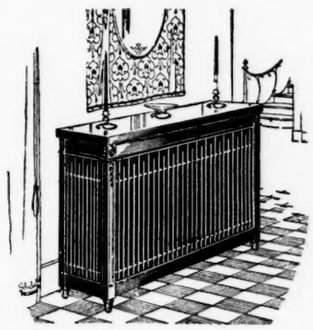

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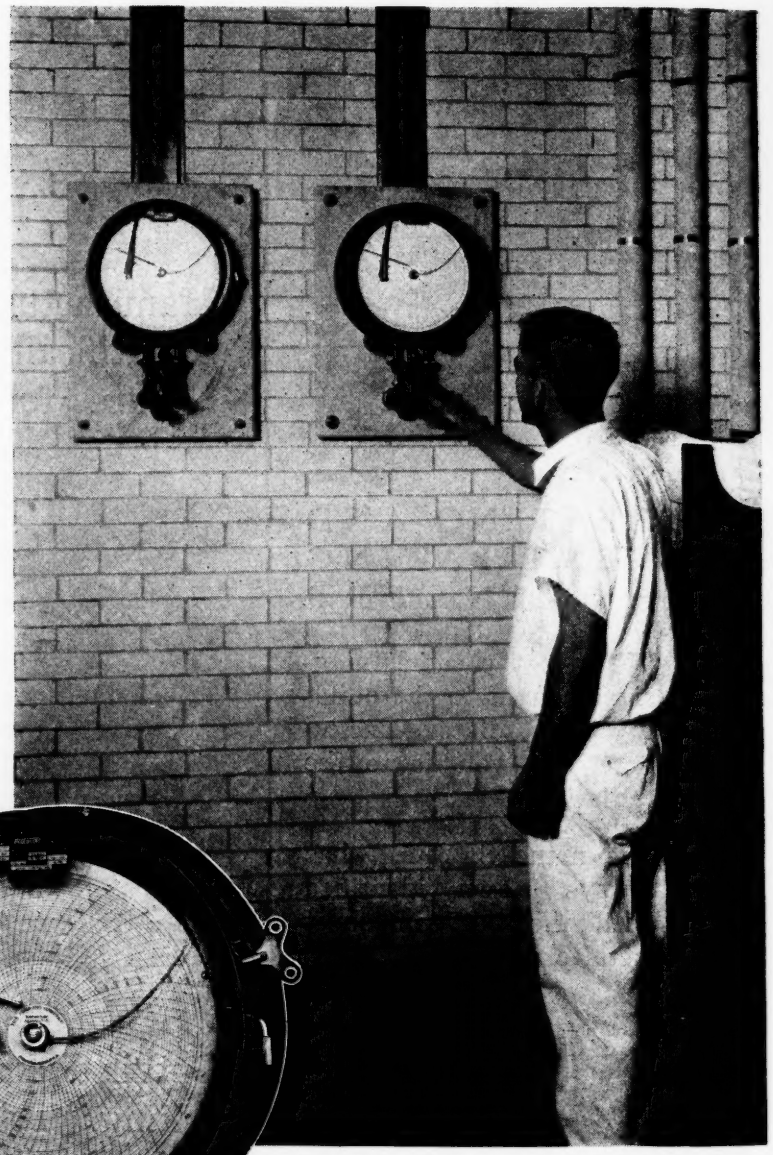

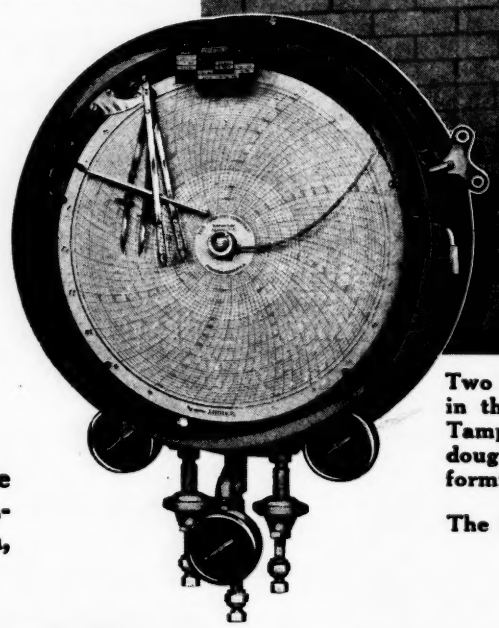

Two Foxboro Humidity Recorder-Controllers in the proof rooms of the Seybold Bakery, Tampa, Florida. These Instruments control dough fermentation, which increases the uniformity of taste and quality of bread.

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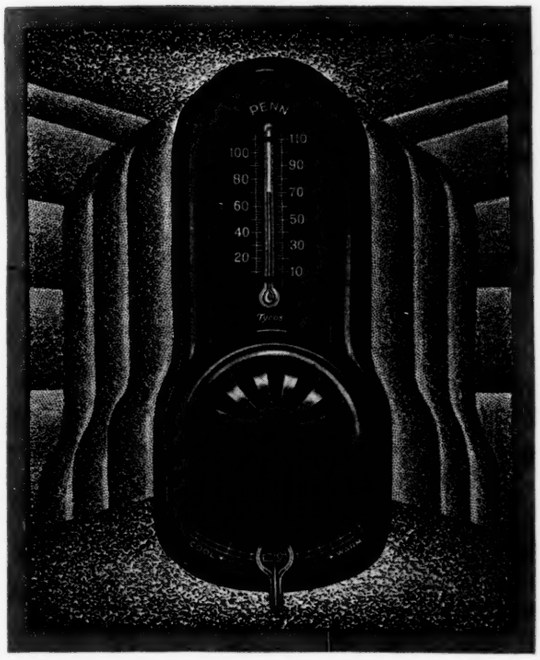
INSTRUMENTS for CONTROLLING, RECORDING and INDICATING TEMPERATURE, FLOW, HUMIDITY and PRESSURE



--In the Spot light *at the* International Exhibition ~~

Penn Automatic Controls

STEP over to Booth 548 when at the International Exposition. A cordial welcome awaits you. Here you will find the complete line of Penn Automatic Control Switches. Among them, there will be the new Penn Thermostat for oil burners and unit heaters. You will be amazed at its unique simplicity. Specifically designed for across the line service, it carries the load direct, even up to 1 H. P. single phase, A. C. and ½ H. P., direct current. It embodies the exclusive Penn Magnet Structure, and operates on less than 2 degrees differential. While in our booth, you may examine the Penn Thermostat for yourself. Observe its quick action, note its performance, and study its simplicity of construction. Remember, Booth 548. It will be worth your while.

A Complete Line of Automatic Electric Switches for

Oil Burners
Pumps
Refrigerators
Air Compressors
Thermostatic Switches
Float Switches
Unloader Pilots
Vacuum Switches
Pressure Switches

Each represents the acme of engineering thought

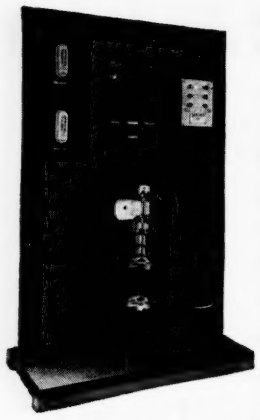
All Penn Automatic Controls are listed as Standard by Underwriters' Laboratories

PENN ELECTRIC SWITCH CO.
DES MOINES, IOWA

PENN

Manufactured by an organization of proven engineering ability that supplies the largest and best concerns of the country with automatic control switches

DUNHAM



Watch the valve operate under thermostatic control. See the signal lights change as valve responds to demand of thermostats.

* * * *

The Dunham Differential Temperature Control Valve controlled by one or more thermostats varies the rate of steam supply to meet heat demand which varies with weather conditions.

The Control Panel (in boiler room) indicates to the engineer the functioning of the system.

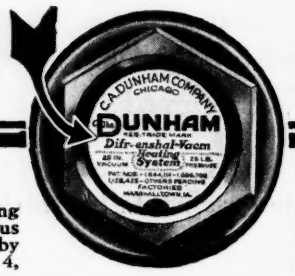
The Signal Panel in superintendent's office indicates to him simultaneously with the Control Panel just how the system is functioning.

At Booths 554-5 and 608-9

The International Heating and Ventilating Exposition Philadelphia, January 27-31

You will see a working unit of the Dunham Differential Heating System. Examine the simple and effective principles of operation of the Differential System and find out how it saves from 25 to 40% in fuel, and at the same time maintains superior standards of heating service.

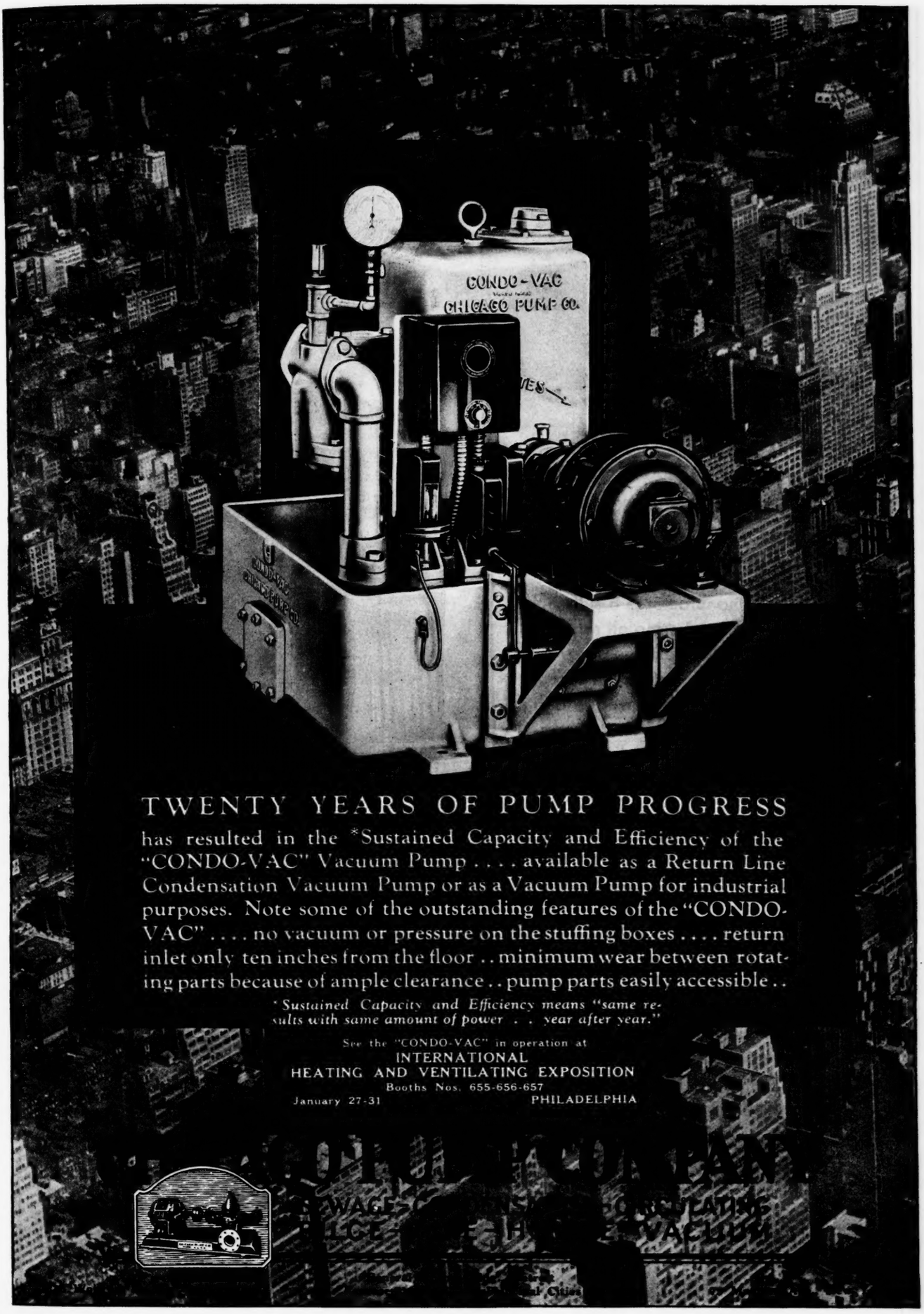
Look for the name DUNHAM



This nameplate identifies a genuine Dunham Thermostatic Radiator Trap.

The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,114, 1,706,401, and 1,727,965 and Canadian Patents Nos. 282,193, 282,194, and 282,195. Additional patents in the United States, Canada and foreign countries are now pending.

HEATING



TWENTY YEARS OF PUMP PROGRESS

has resulted in the *Sustained Capacity and Efficiency of the "CONDO-VAC" Vacuum Pump . . . . available as a Return Line Condensation Vacuum Pump or as a Vacuum Pump for industrial purposes. Note some of the outstanding features of the "CONDO-VAC" . . . . no vacuum or pressure on the stuffing boxes . . . . return inlet only ten inches from the floor . . minimum wear between rotating parts because of ample clearance . . pump parts easily accessible . .

*Sustained Capacity and Efficiency means "same results with same amount of power . . year after year."

See the "CONDO-VAC" in operation at
INTERNATIONAL
HEATING AND VENTILATING EXPOSITION
Booths Nos. 655-656-657
January 27-31 PHILADELPHIA

Specify

WALWORTH VALVES FITTINGS AND TOOLS

WALWORTH MAKES BRONZE VALVES FOR EVERY PRACTICAL PRESSURE

Walworth manufactures a full line of bronze valves covering all requirements up to the highest pressures for which bronze can safely be used. These include both solid wedge and double disc gate valves and a complete line of globe, angle and check valves with the various accepted types of seats and discs. ● One of the popular valves used where a heavier than standard valve is desired is the Walworth Fig. 225M for 150 lbs. W. S. P. illustrated here. ● It is of especially sturdy construction, with gland in stuffing box, non-heating malleable hand wheel and can be repacked under pressure when the valve is wide open.

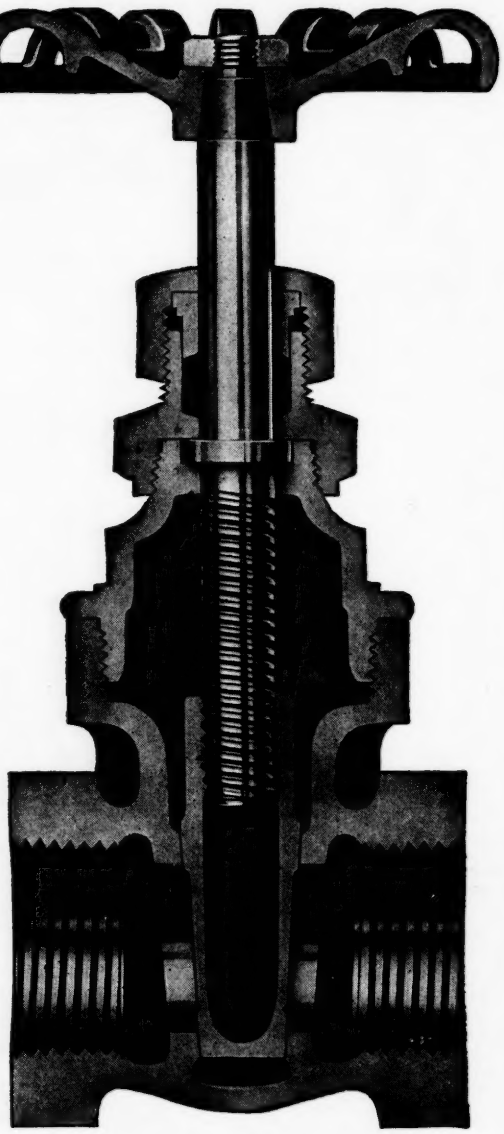


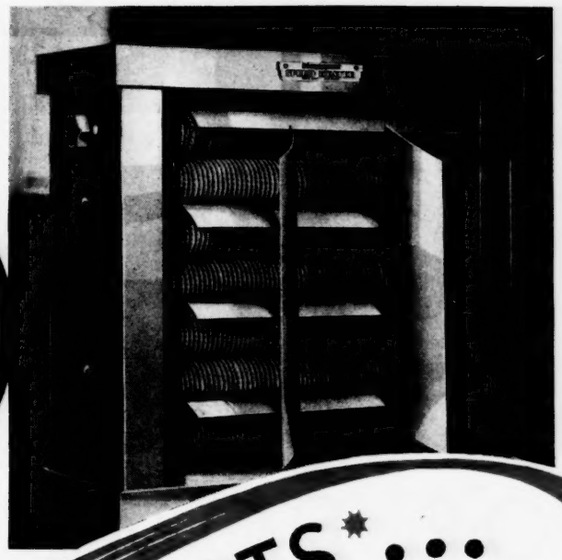
FIG. 225M SECTIONAL

for

PLUMBING AND HEATING

WALWORTH

Walworth Company, General Sales Offices: 51 East 42nd St., New York
Plants at Boston, Mass.; Kewanee, Ill.; Greensburg, Pa.; and Attalla, Ala.
Walworth Company Limited, 620 Cathcart St., Montreal, P. Q.
Walworth International Co., 11 Broadway, New York, Foreign Representative
. . . Distributors in Principal Cities of the World . . .



THE PERTINENT FACTS*...

* This advertisement was suggested by a prominent Architect.

...about SPEED HEATERS

"As many useful facts as possible... all the data and no drama"...

SPEED HEATERS are suspended electric blower-type steam heaters for industrial and commercial applications. Very rapid action. May be thermostatically controlled. Extremely economical in first cost and operation.

"Facts, with the least insulation possible"...

SPEED HEATERS have two operating speeds. High speed for quick heating. Low speed for maintaining set temperature. All models equipped with high pressure Aerofin... for steam pressures up to 350 lbs. Vertical louvres spread air steam over wide area. Units are very quiet.

Sturtevant men are in principal cities ready to figure on short notice. Our "blue" catalog contains complete working data for Architects and Engineers. Copies distributed by our local offices. The coupon awaits your pencil.

THE PRICE IS 'WAY DOWN

COUPON

B. F. STURTEVANT CO.
Hyde Park, Boston, Mass.

Kindly send me a copy of the SPEED HEATER DATA BOOK.

Name of Company.....

Street Address.....

City.....*State*.....

B. F. STURTEVANT COMPANY

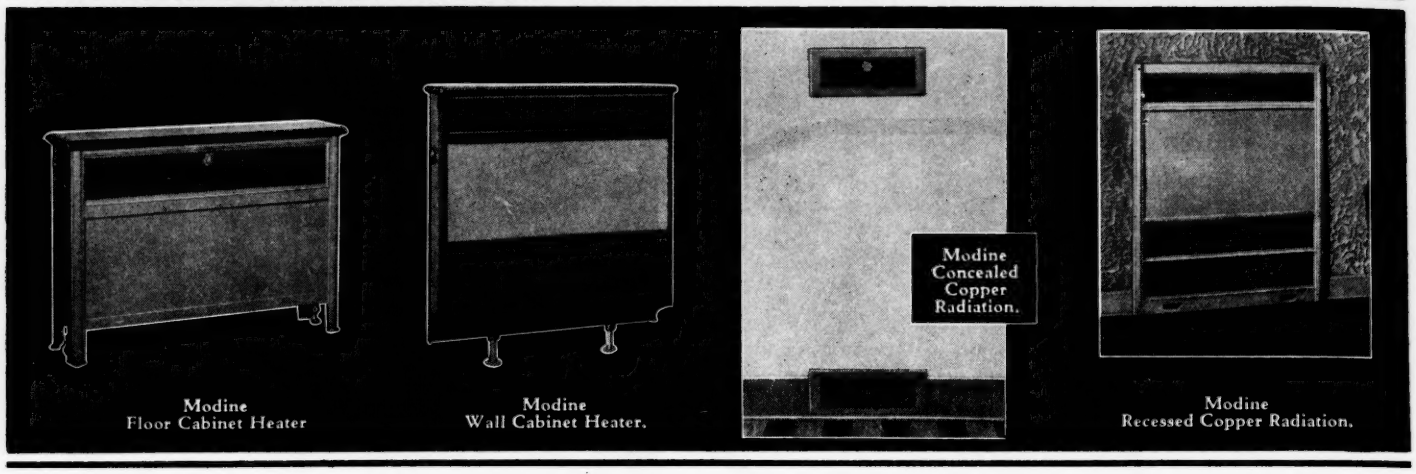
Plants and Offices at: Berkeley, Cal. ⋎ Camden, N. J. ⋎ Framingham, Mass. Galt, Ontario ⋎ Hyde Park, Mass. ⋎ Sturtevant, Wis.

Branch Offices at: Atlanta; Boston; Buffalo; Camden; Charlotte; Chicago; Cincinnati; Cleveland; Dallas; Denver; Detroit; Hartford; Indianapolis; Kansas City; Los Angeles; Milwaukee; Minneapolis; Newark; New York; Omaha; Pittsburgh; Portland; Rochester; St. Louis; San Francisco; Seattle; Washington, D. C. *Canadian Offices at:* Toronto; Montreal and Galt. ⋎ *Canadian Representatives:* Kipp Kelly, Ltd., Winnipeg

Also Agents in Principal Foreign Countries

Sturtevant
(REG. U. S. PAT. OFF.)

SPEED HEATERS
"More Heat Less Steam"



Modine Floor Cabinet Heater

Modine Wall Cabinet Heater.

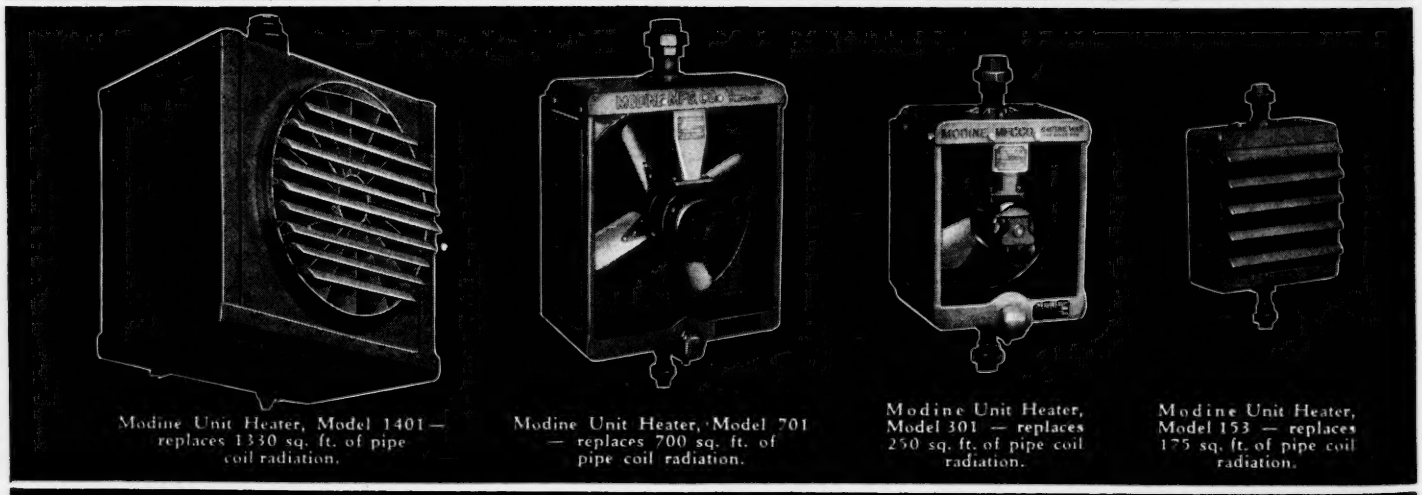
Modine Recessed Copper Radiation.

FOR HOME OR FACTORY

MODINE

COPPER RADIATION

See the complete
MODINE LINE
Booths 910-911
HEATING AND
VENTILATING SHOW



Modine Unit Heater, Model 1401— replaces 1330 sq. ft. of pipe coil radiation.

Modine Unit Heater, Model 701 — replaces 700 sq. ft. of pipe coil radiation.

Modine Unit Heater, Model 301 — replaces 250 sq. ft. of pipe coil radiation.

Modine Unit Heater, Model 153 — replaces 175 sq. ft. of pipe coil radiation.

Modine

MANUFACTURING COMPANY

1707 RACINE STREET RACINE, WIS.

YOU CANNOT BUY BETTER QUALITY

With full realization of just what this statement means, we repeat that better quality heating appliances are *not* manufactured than those which make up the Barnes & Jones Vapor and Vacuum Heating Systems. Furthermore, we do not believe that better quality appliances *can* be manufactured.

Barnes & Jones

Vapor and Vacuum Heating
Systems of Proven Quality

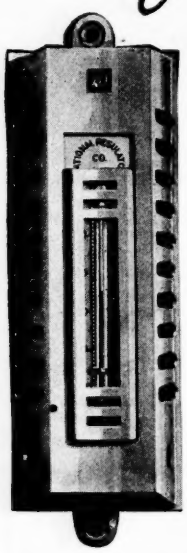
Backed by 30 Years' Experience
as Heating Engineers
and Manufacturers

128 Brookside Avenue
Jamaica Plain, Boston

101 Park Avenue
New York City

The Sign B&J *of Quality*

NATIONAL CONTROL of Temperature and Humidity



FOR a quarter of a century, and longer, this organization has worked for the betterment of heating and air conditioning control apparatus.

The results of this work are a record of development:

The development of National Thermostats for any form of temperature control.

The development of National Humidity Controllers for maintaining constant relative humidity in blast heating and air conditioning.

The development of National Metaphrams for valves, damper motors and damper regulators.

The development of auxiliary operating equipment for the continuous functioning of this apparatus with a minimum of maintenance trouble.

Possibly we could have been content to "ride along" on the basis of our first discoveries, because many of the National Systems installed over twenty years ago are still functioning with an accuracy and dependability that is working proof of the correctness of their design and installation.

But—the installations of National Systems being made today are the culmination of all this experience, all this development, and all this study of heating, ventilating and air conditioning control requirements.

The untiring efforts that have brought about the perfection of National equipment have also brought to us an ever increasing number of installations that are the peer of their kind, and an ever increasing number of architects and engineers, nationally and internationally known for the excellence of their work, who rate National apparatus as their standard of efficiency.

National control equipment for heating and air conditioning is described in five different pieces of literature:

National Heat Regulation (a pictorial synopsis of National installations).

National Heat Regulation, Mechanically described (a loose leaf booklet of National Thermostats, Humidity Controllers and auxiliary equipment).

A-Jacks Steam Damper Regulator (for high pressure boilers).

Bulletin LP-100—Metaphram Damper Regulators (for low pressure heating boilers).

Bulletin F-100 — Metaphram Type "F" Damper Regulators (for hot water boilers and domestic water heaters).

Any of this literature will be mailed to you, if you are interested. Just check the coupon and pin it to your letterhead.

Or, if you have a specific problem of temperature or air conditioning control to be solved, the services of this organization are at your disposal without obligation.

NATIONAL

National Systems of Heat Regulation and Humidity Control, Metaphram Dampers, Metaphram Motors, Industrial Thermostatic Devices, A-Jacks Steam Damper Regulator for high pressure boilers, Metaphram Damper Regulators for domestic steam, vapor, vacuum and hot water heating boilers, Metaphram Furnace Regulators.

METAPHRAM

NATIONAL REGULATOR CO., 2306 Knox Ave., Chicago

Send us the following literature:

☐ National Heat Regulation.

☐ National Heat Regulation, Mechanically described.

☐ A-Jacks Steam Damper Regulator.

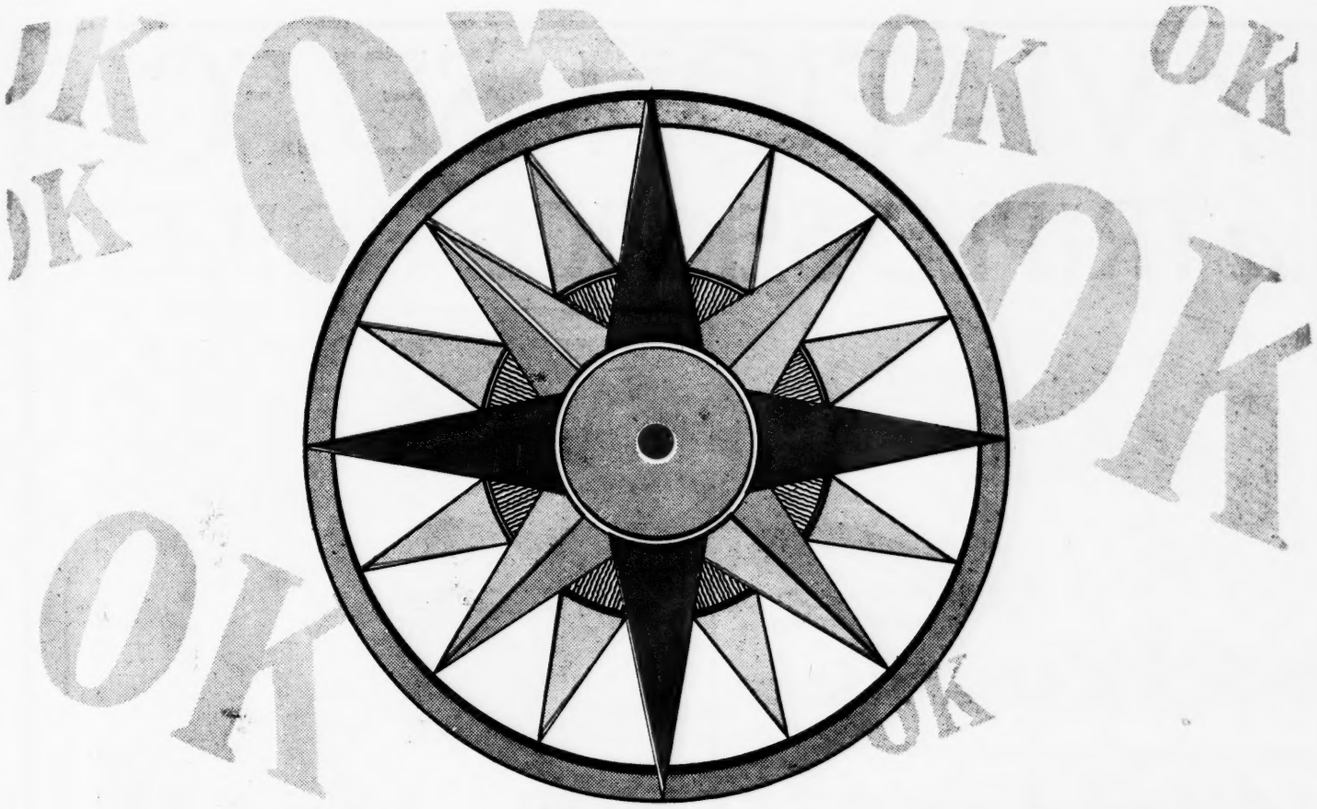
☐ Bulletin LP-100.

☐ Bulletin F-100.

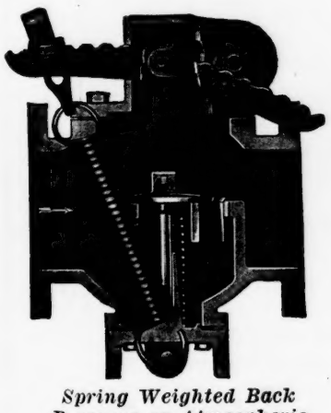
Address attention of.....

(Please enclose with your letterhead)

NATIONAL REGULATOR CO. CHICAGO



USED and APPROVED in EVERY LOCALITY

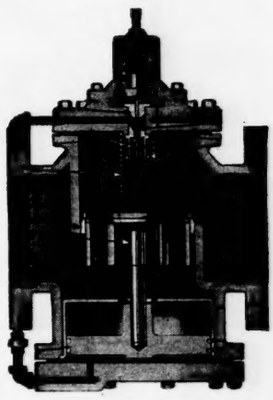


Spring Weighted Back Pressure or Atmospheric Relief Valve

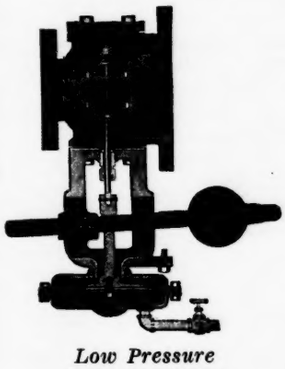
To the North, South, East or West, wherever you go—you will find Kieley & Mueller Specialties serving exclusively on the steam, water, air, gas and oil lines of leading industrial plants.

This widespread use and acceptance was not accomplished in a day, but over a period of **fifty years** of painstaking but sure development. The results have been most gratifying, and authoritative engineers have acclaimed the Kieley & Mueller line as a major contribution to industry.

Write for the 250-page Catalog No. 57. It is full of information. No obligations.



High Pressure Pilot operated Reducing Valve



Low Pressure Reducing Valve

Booth 962 KIELEY & MUELLER, Inc. **Booth 962**

34 West 13th St., New York

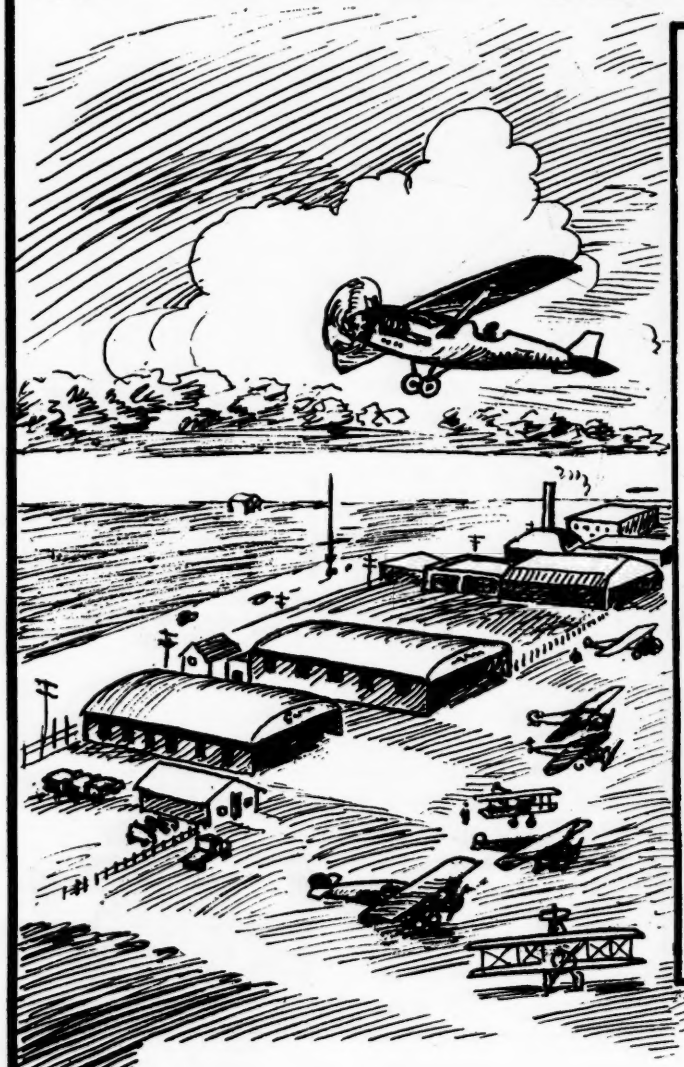
ESTABLISHED 1879

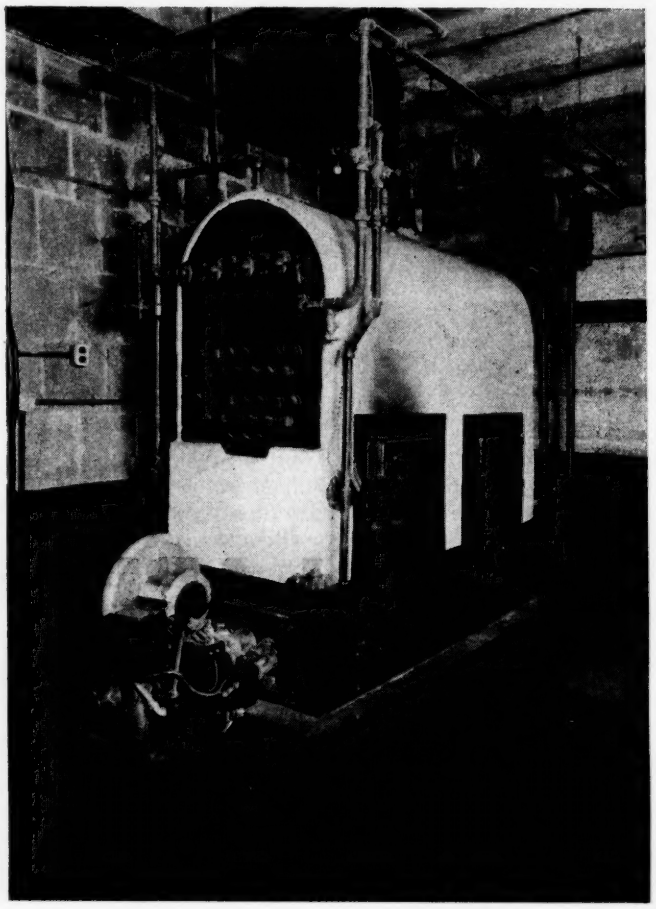
KIELEY

REGISTERED TRADE MARK

High and Low Pressure Steam Traps

AVIATION SELECTS *a* TRIPLE-SERVICE BOILER





TRIPLE-SERVICE boilers again extend their all-around utility service by supplying Aviation with heat, hot water and incineration. With the rapid strides Commercial Aviation has made, buildings are being constructed to comfortably house the Administration Officials and the traveling public, and boilers have become an integral part of the construction plans.

When the Administration Building of the Connecticut Department of Aeronautics at Brainard Field, Hartford, Conn., was ready for its boiler, Captain Clarence M. Knox, Commissioner of Brainard Field, after thoroughly studying the merits of the well known boilers in the market, selected a Triple-Service boiler because in the Triple-Service he found the ideal features that will give him the utmost in boiler service at minimum investment and operating cost.

If you are interested in boiler economy, whether it is for an aviation building, a private home, or an apartment or a public building, you should get the Triple-Service facts from our nearest distributor listed below before you make your final choice.

INTERNATIONAL BOILER WORKS CO.

EAST STROUDSBURG, PA.

DISTRIBUTORS

THERMO SERVICE, Inc.
New York City, N. Y.

OIL BURNER CORP.
Trenton, N. J.

CHAS. T. KING & CO.
Baltimore, Md.

WARNER PLUMBING & HEATER CO.
Atlanta, Ga.

WILLIAM G. ROBELEN
Wilmington, Del.

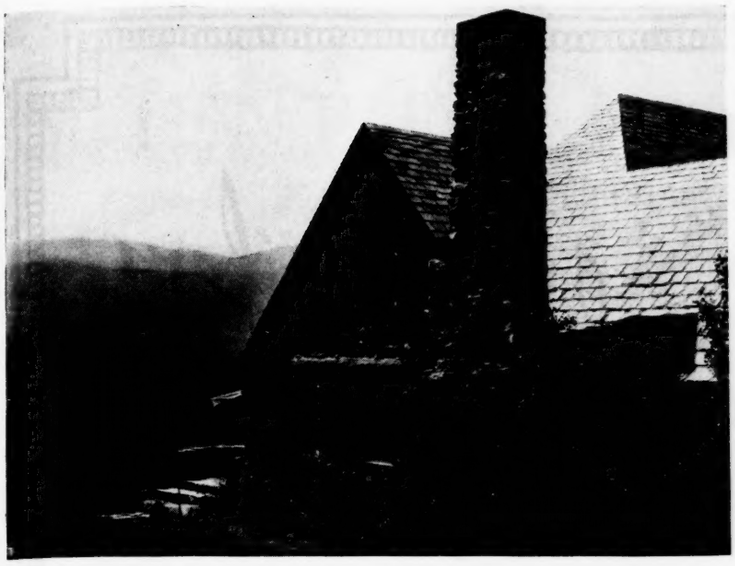
HEATING EQUIPMENT CORP.
Boston, Mass.

JAMES A. CONDON, Inc.
Philadelphia, Penna.

Mr. B. FRANK TOUCHSTONE
Lexington, N. C.

AUTOMATIC HEAT CORP.
Jacksonville, Fla.

INCINERATOR & ENGINEERING CO., Montreal, Canada



Booth 954
at the
Heating and Ventilating
Exposition

There is a vast difference between the fuel requirements of a residence and a power plant.

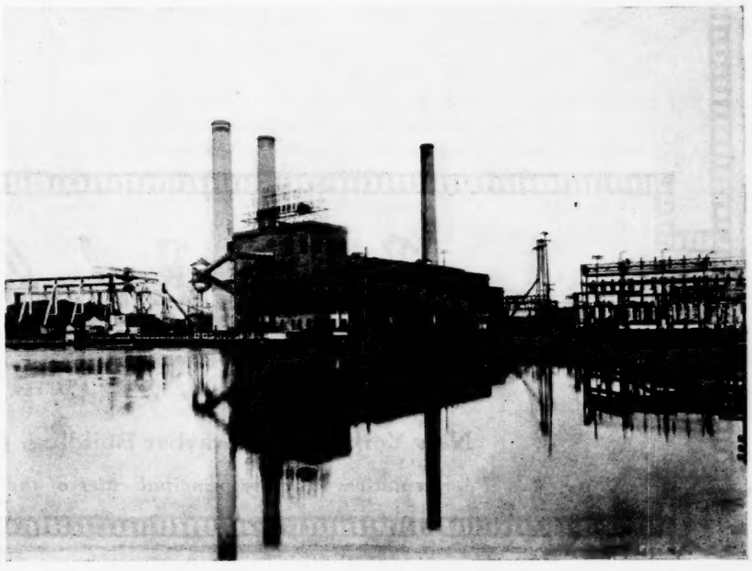
ANTHRACITE is sufficiently flexible and is prepared in various sizes to serve both with the same SAFETY, ECONOMY, and CONVENIENCE.

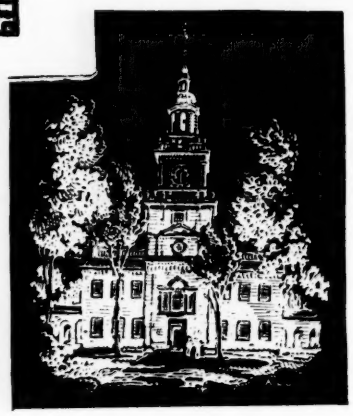
Modern stokers and automatic controls are likewise equally applicable, adding the desirable factors of labor saving and convenience.

ANTHRACITE COAL SERVICE maintains representatives in all hard coal burning centers, and are anxious to cooperate with you in the solution of any problems involving the use of fuel.

ANTHRACITE COAL SERVICE, 1421 CHESTNUT ST., PHILADELPHIA

District Offices
throughout the
Anthracite burning territory



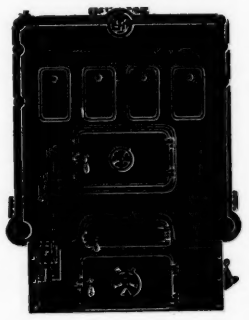


Burnham Boilers

Find Out about Burnhams at The Philadelphia Show

An interesting exhibit of Burnham Boilers for every heating purpose has been arranged for the International Heating and Ventilating Exhibition at the Commercial Museum, in Philadelphia, January 27 to 31 inclusive.

You are cordially invited to meet us there, and will be given every facility for study of these powerful, dependable boilers in relation to your installation problems.



Burnham Boiler Corporation

IRVINGTON, NEW YORK

New York Office: Graybar Building, 420 Lexington Avenue

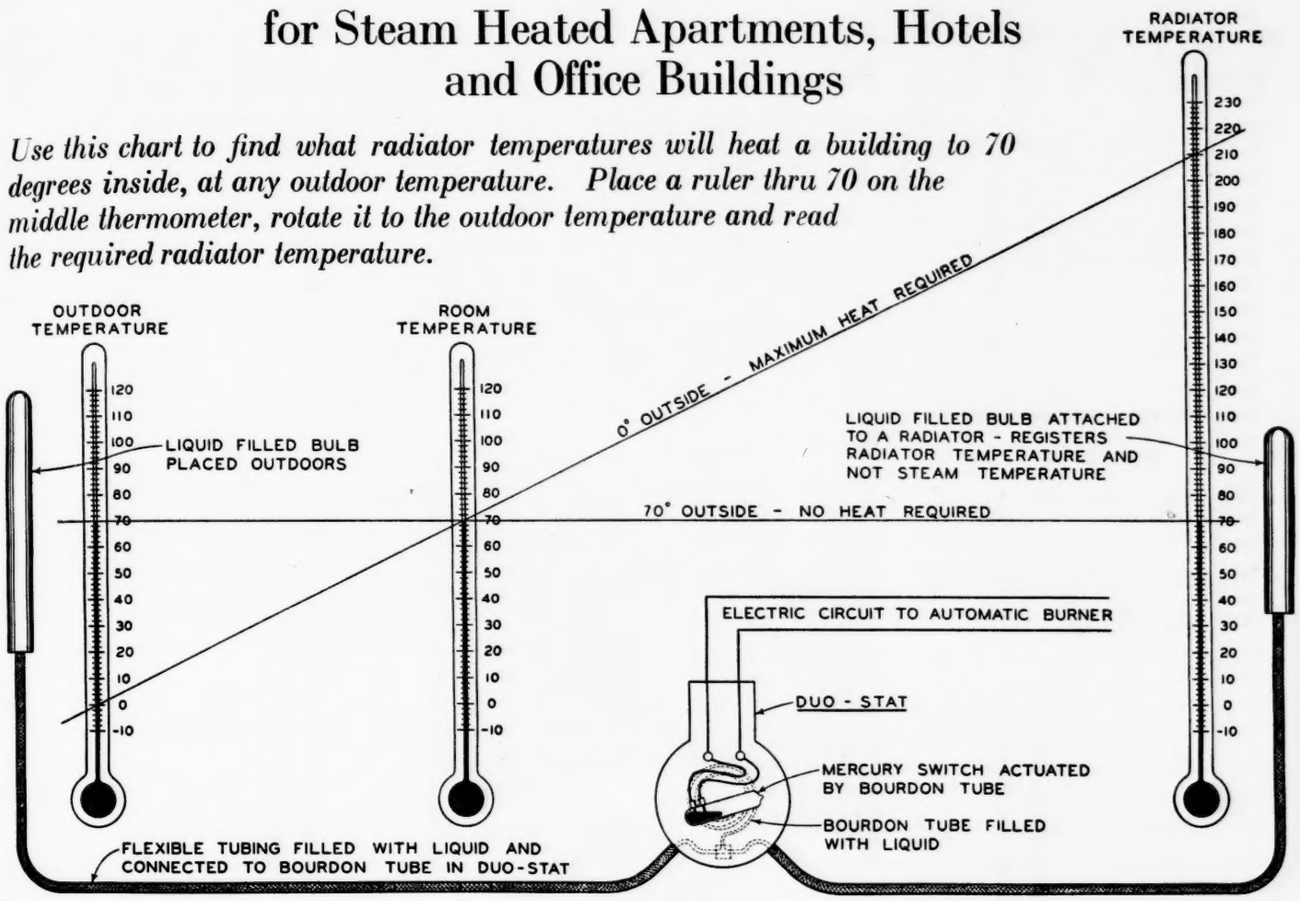
Representatives in many principal cities of the United States and Canada

A New Method of

SCIENTIFIC HEAT CONTROL

for Steam Heated Apartments, Hotels and Office Buildings

Use this chart to find what radiator temperatures will heat a building to 70 degrees inside, at any outdoor temperature. Place a ruler thru 70 on the middle thermometer, rotate it to the outdoor temperature and read the required radiator temperature.


OUTDOOR TEMPERATURE
ROOM TEMPERATURE
RADIATOR TEMPERATURE
120 110 100 90 80 70 60 50 40 30 20 10 0 -10
230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
0° OUTSIDE - MAXIMUM HEAT REQUIRED
70° OUTSIDE - NO HEAT REQUIRED
LIQUID FILLED BULB PLACED OUTDOORS
LIQUID FILLED BULB ATTACHED TO A RADIATOR - REGISTERS RADIATOR TEMPERATURE AND NOT STEAM TEMPERATURE
ELECTRIC CIRCUIT TO AUTOMATIC BURNER
DUO - STAT
MERCURY SWITCH ACTUATED BY BOURDON TUBE
BOURDON TUBE FILLED WITH LIQUID
FLEXIBLE TUBING FILLED WITH LIQUID AND CONNECTED TO BOURDON TUBE IN DUO-STAT

The heating plant in any building, with steam heat, is always designed and proportioned to maintain the building at 70 degrees, inside, when the radiator temperature and the outdoor temperature are maintained in the relation shown in the above chart.

The Raymond Duo-Stat controls any automatic steam heating plant, directly from both the radiator temperature and the outside temperature, so as to maintain this relation. It may be adjusted to suit buildings which differ from this standard.

Not only does the Duo-Stat maintain this relation in the one radiator to which it is attached but the operation of the heating plant, under this control, is such that complete and equal distribution of steam to all radiators is positively assured in all kinds of weather.

Radiators are completely filled with steam in cold weather, and only partially filled with steam in mild weather.

This scientific method of control has been applied to all types of heating plants with the following results.

1. Complete satisfaction to the tenants, due to uniform, even heat, and constantly warm radiators without overheating.
2. Complete satisfaction to the janitor due to satisfactory performance of the heating plant under fully automatic control.
3. Complete satisfaction to the owner due to a 10 to 30 per cent reduction in fuel costs resulting from the ability to heat the building properly without wasting fuel in overheating.
4. Complete satisfaction to the dealer due to lack of complaints and service calls.

The Raymond Duo-Stat for steam is an outstanding development in the field of automatic heat, not only as a control instrument but also as an operating principle. So far as we know it is the only instrument which gives satisfactory automatic control of an oil burner in apartments, hotels and office buildings.

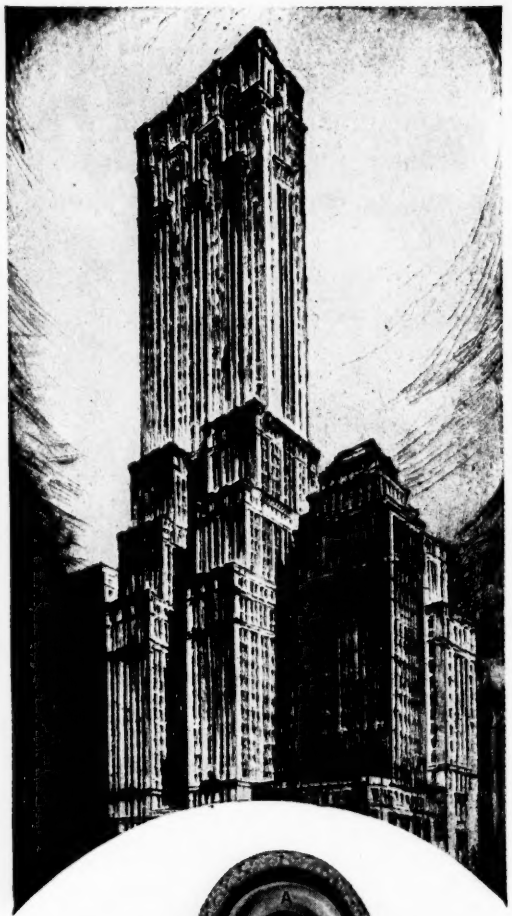
It is sold direct to dealers, by us or through our distributors, at a list price of $100. Installation costs vary from $25 to $150, depending upon the installation. It can easily be installed, without special tools, from the instructions which are furnished with the instrument.

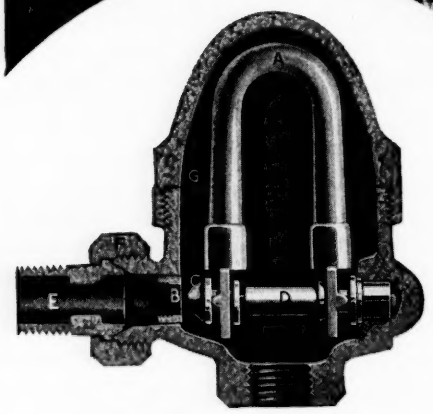
A large size copy of the above chart will be mailed you, with complete description of the Duo-Stat, and dealers discounts upon request, mentioning this advertisement.

F. I. RAYMOND CO. Builders Building 228 No. La Salle St. **CHICAGO**

HAINES

VENTO TRAPS





The heating system in the Lincoln Building, New York City, is equipped with Haines Vento Traps to insure perfect control of temperature.

Consulting Mechanical Engineer
Clyde R. Place
Heating Contractor
Baker Smith & Company
Architect
J. E. R. Carpenter

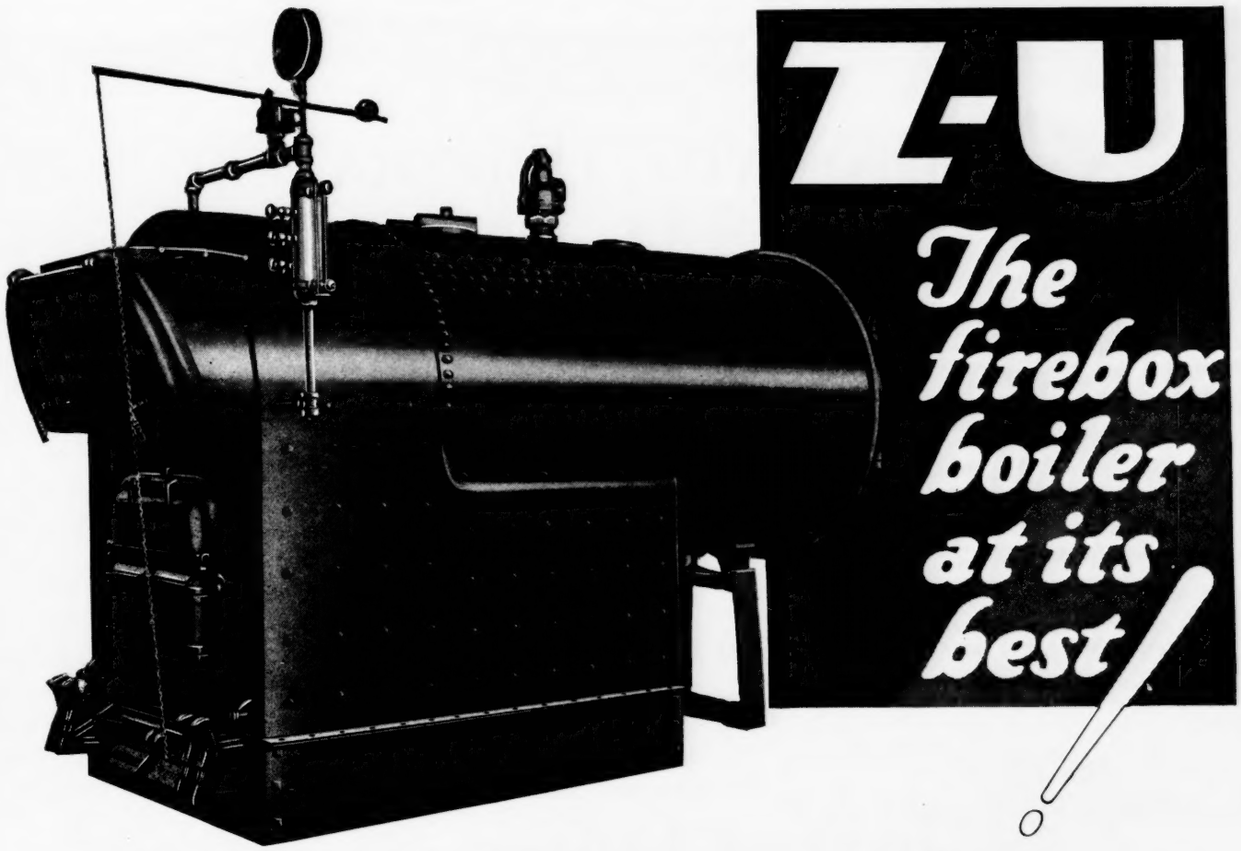
See us at Booths
1050—1051
Philadelphia
Jan. 27-31

WILLIAM S. HAINES & CO.

MANUFACTURERS OF

HAINES VAPOR AND VACUUM
STEAM HEATING SPECIALTIES

TWELFTH & BUTTONWOOD STREETS
PHILADELPHIA PENNSYLVANIA



Steam at substantially lower cost

TYPES FOR ALL FUEL REQUIREMENTS

The Z-U Steel Firebox Boiler for steam or hot water heating is built in the following types:

SMOKELESS TYPE for burning soft coal smokelessly.

UPDRAFT TYPE for burning bituminous coal, anthracite coal, including buckwheat sizes, coke and wood.

OIL, GAS, STOKER TYPE for oil or gas or automatic stoker firing.

RATINGS—4,000 to 34,000 sq. ft. radiation.

See our line of Steel Boilers at the International Heating and Ventilating Exposition, Philadelphia, Jan. 27th to 31st, inclusive. Booths 243, 244, 319, 320.

Taking the usual lines of the firebox boiler as a basis, the Z-U incorporates many radical advances, each one a big step ahead toward minimum steam cost.

In the Z-U Boiler, the design of the firebox compels the combustible gases to surge violently to the front of the boiler where they mix completely with the incoming secondary air.

Complete combustion is assured—no unburned gases can reach the tubes.

Other elements in Z-U design cause a decidedly positive water circulation *along* the tubes, rather than *across* them, which gathers in its course every possible heat unit. Quick steaming and low cost operation are assured by these radical developments, which are fully and graphically brought out in the new Z-U Catalog.

Every progressive heating engineer and contractor will want this information. ***Write for a copy—now.***

FITZGIBBONS BOILER CO., Inc.

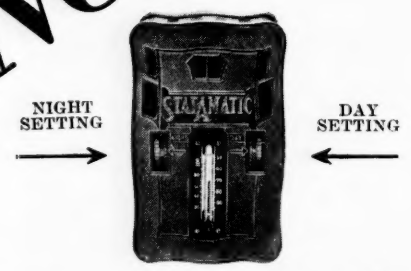
574 Seventh Avenue **New York, N. Y.**

***Works;* OSWEGO, N. Y.**

BRANCHES AND REPRESENTATIVES IN PRINCIPAL CITIES

NOW! AUTOMATIC TEMPERATURE SHIFT

—DAY to NIGHT—WEEK ENDS—HOLIDAYS—



A truly beautiful design—two tone bakelite

This is the dual control thermostat of Stat-Amatic, so sensitive it will 'feel' any variation of temperature and thus provide an accurate maintenance of desired temperatures during the entire 24 hours. Once the dials are set, the control, being entirely self operating, requires no further attention unless a new range of temperature is desired.

Here is the motor and *electric motor wound* 15 jewel clock unit of Stat-Amatic which operates drafts, dampers and valves. A typical Stat-Amatic unit has already operated more than 81,000 times in a life test, a normal life of over 29 years, without replacing or oiling a single part. The *electric motor wound* clock has many remarkable features and its efficiency is attested by the fact that over 110,000 are now in daily use for various applications. Being automatically wound by an electric motor, not operated directly from the electric current, the clock of Stat-Amatic will continue to operate through any temporary period of current failure. Indeed, it would run for 3½ days even though the current is entirely off.

STAT-AMATIC INSTRUMENT & APPLIANCE CO.

HARTFORD, CONN.

Representatives in many principal cities.

Stat-Amatic Instrument & Appliance Co., Hartford, Conn.

Please mail copy of book HV1.

Name.....

Address.....

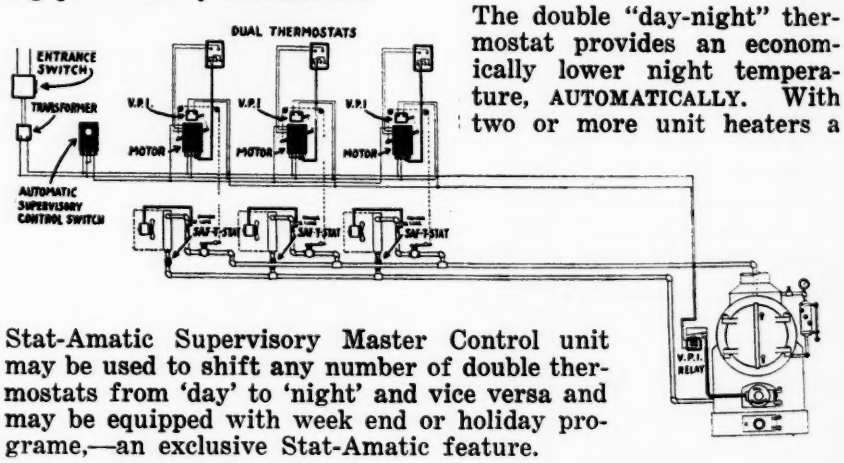
STAT-AMATIC assures uniform, unvarying heat during the day ... AUTOMATIC SHIFTING TO AN ECONOMICALLY LOWER TEMPERATURE LEVEL AT NIGHT AND OVER WEEK ENDS OR HOLIDAYS ... it constantly checks the temperature in all parts of the building ... maintains heat for offices after factory temperature has been reduced and being automatic ***"it never forgets."***

With dual control thermostat and *electric motor wound* clock Stat-Amatic is so flexible and so accurate that it is today mastering innumerable complicated problems of heat control and temperature regulation which, to the factory owners, seemed impossible to solve, as well as less difficult problems, in a manner utterly beyond the range of human possibility and,—"it never forgets."

STAT-AMATIC and UNIT HEATERS

Steam supply to each Unit Heater is regulated individually by double thermostat. Saf-T-Stat prevents fan motor from operating until feed line of Unit Heater is up to proper temperature, thereby preventing fan from blowing cold air.

Motor, connected to thermostat, opens valves when heat is demanded by one or more thermostats and closes valves when they are satisfied. When all thermostats are satisfied the Valve Position Indicator Relay opens circuit and shuts off automatic stoker or burner until some section of building again demands more heat. This system of Stat-Amatic control precludes the necessity for carrying boiler pressure except when heat is demanded from any sections of building protected by thermostats.

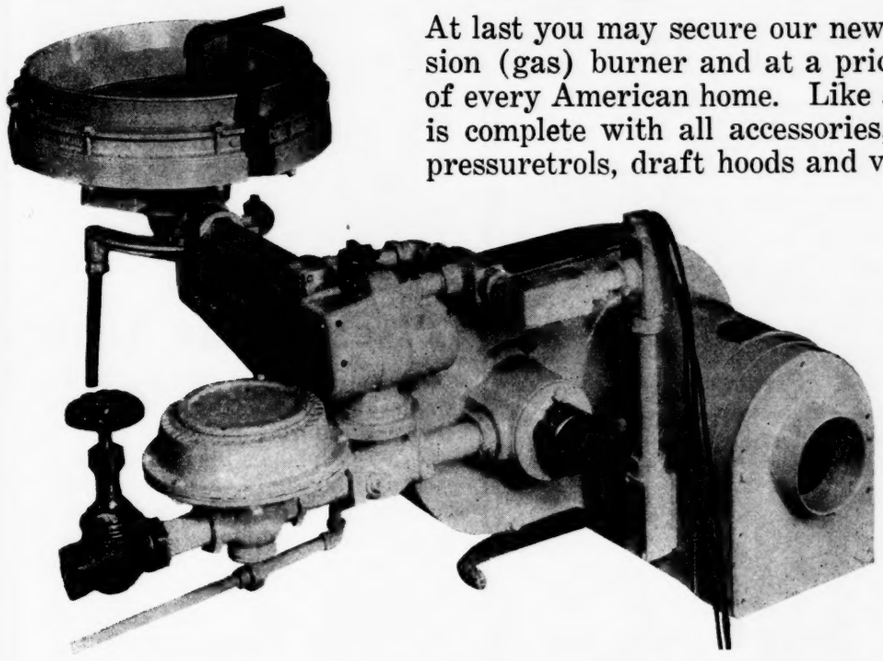


The double "day-night" thermostat provides an economically lower night temperature, AUTOMATICALLY. With two or more unit heaters a Stat-Amatic Supervisory Master Control unit may be used to shift any number of double thermostats from 'day' to 'night' and vice versa and may be equipped with week end or holiday programe,—an exclusive Stat-Amatic feature.

STAT-AMATIC

DAY *"temperature regulator"* NIGHT

MATERIAL PLUS WORKMANSHIP



At last you may secure our new "Utility Style" conversion (gas) burner and at a price well within the reach of every American home. Like all S & D conversions, it is complete with all accessories, even to aquastats and pressuretrols, draft hoods and valves.

It will supply dependable gas heating service and its cost of operation will not exceed that of a gas designed boiler.

See our Exhibit at the International Heating and Ventilating Exposition Spaces 102-103.

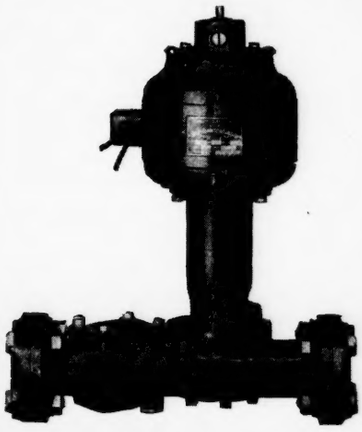
Sweet & Doyle Foundry and Machine Co.

HAYNES SELLING CO., INC.
PHILADELPHIA

TROY, NEW YORK

50 CHURCH ST.
NEW YORK

For "Sick" Hot Water Jobs Always Prescribe A HYDROLATOR



Whenever you run up against a faulty, sluggish hot water job, your first thought should be of the HYDROLATOR. This unit is a motor-driven centrifugal pump which drives the water through the system in spite of traps, short circuit, pipe restrictions, etc.

Its success is proven on hundreds of installations all over the world, and some of its cures have been almost miraculous. Full details in Bulletin No. 729-H. WRITE FOR IT!

JANETTE MANUFACTURING COMPANY

556-58 West Monroe Street
CHICAGO

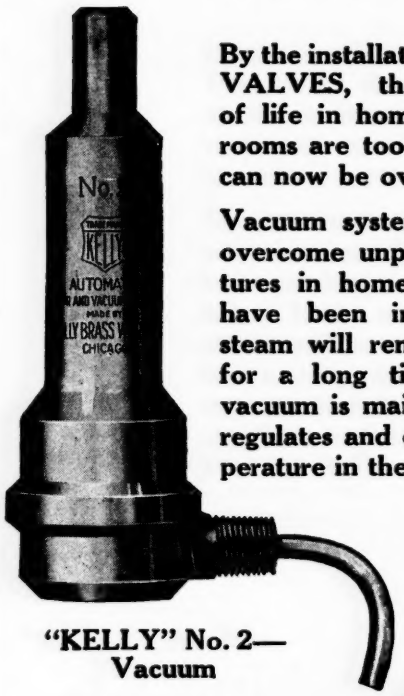
Singer Bldg.,
149 Broadway,
New York, N. Y.

Real Estate
Trust Bldg.,
Philadelphia.

Distributors Everywhere

"KELLY" VALVES

SAVE FUEL



By the installation of "KELLY" VALVES, the disadvantages of life in homes in which the rooms are too hot or too cold can now be overcome.

Vacuum systems have largely overcome unpleasant temperatures in homes in which they have been installed because steam will remain in radiators for a long time if a partial vacuum is maintained and this regulates and controls the temperature in the rooms.

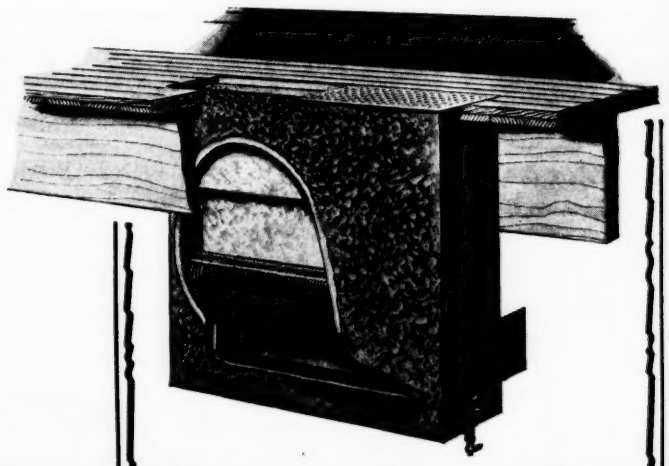
"KELLY" No. 2—Vacuum

"KELLY" No. 6—Vacuum

The measure of our service is revealed in the fact that we have for over thirty-five years been manufacturers of Non-Adjustable Automatic Steam, Air and Vacuum Valves. The "Kelly" line is a complete line that has stood the test of time—being constantly perfected until the highest possible efficiency has been achieved.

Have your steam heating system equipped with these valves and obtain greater saving in fuel. They are guaranteed to you for a term of FIVE years.

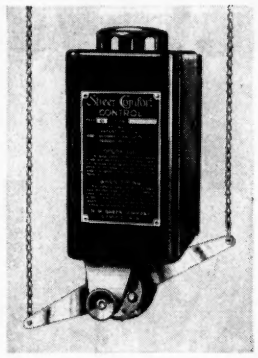
KELLY BRASS WORKS
226-232 W. Ontario Street
CHICAGO, ILL.



The Thermoist Unit

is the ultimate application of the principles of heating and humidifying in unit form. Its ease of operation insures permanent comfort in the room, a close regulation being allowed by means of a controlled damper. The proper amount of humidity is automatically supplied. It is a sturdily constructed unit, easily installed, which fully merits your investigation.

FRANK E. WOODWARD CO.
19 FRIEND ST. BOSTON, MASS.



Temperature Regulation sells heating plants

Live heating contractors and manufacturers of home heating plants have found that "Sheer Comfort" Heat Regulators open the door to sales opportunities.

"Sheer Comfort" creates sales on its own merit and, when used as original equipment on a home heating plant, it crystallizes the desire of the prospect on *that heating plant.*

Today, home owners want a heating plant that provides automatic temperature regulation. "Sheer Comfort" is fully automatic, and has *four exclusive safety features.*

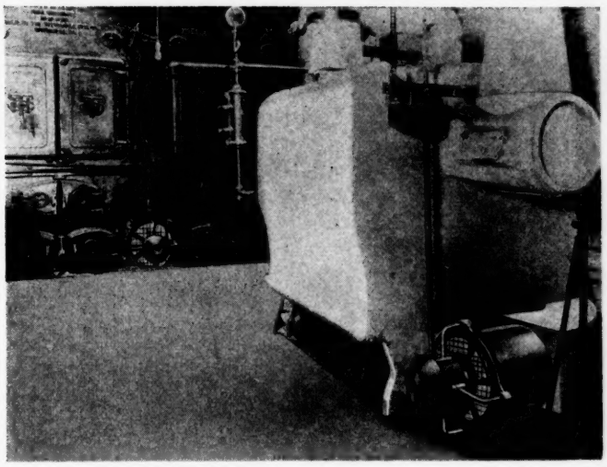
It is so low in cost that manufacturers of home heating plants add it to their original equipment without materially affecting their installed price, and heating contractors use it to remove the sales resistance of competitive plants.

Write for full details of the "Sheer Comfort" proposition, or see it at booth 617 International Heating and Ventilating Exposition.

H. M. SHEER CO.
217 Hampshire Street, Quincy, Ill.
Established 1889

SHEER COMFORT
heat Regulator

25 Years of Leadership in Forced Draft



Wing Blowers are selected by architects, engineers, stoker manufacturers and contractors because they maintain the highest standards of satisfactory operation and durability in a field where reliability is a paramount requirement.

For Heating Boilers	*For Pressure Boilers*
Wing Motor Driven Blowers	Wing Turbine Blowers

Propeller type fans—large air passages and low air velocities give quiet operation and even fires.

Variable speed—regulation by speed control, conveniently operated from front of boiler.

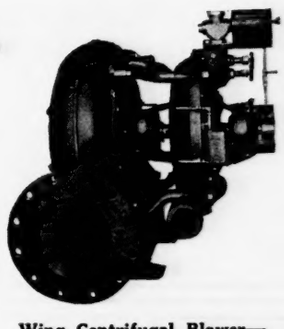
Dust proof construction—totally enclosed motors and filtered turbine lubrication insure long life and low maintenance costs.

L. J. Wing Mfg. Co.

158 W. 14th St., New York, N. Y.

Wing Turbine Blower
The Standard Forced Draft Unit for Pressure Boilers.

Booths 305-6
at the Heating and Ventilating Exposition



Wing Centrifugal Blower—for Improved Gas Producer Operation.

Page 8 of this issue describes Wing Unit Heaters and Ventilating Equipment

SEE THIS REVOLUTIONARY
MODERN
METHOD OF APPLYING BUILDING INSULATION DEMONSTRATED AT BOOTH 258
INTERNATIONAL HEATING AND VENTILATING EXPOSITION

EFFICIENT HEAT AND SOUND INSULATION
SPRAYED ON WITH GUNS

Sprayo-Flake insulation is manufactured and applied in one operation. Prepared flakes of dry fibrous material, previously impregnated with a fire-resisting agent, are forced by air through a specially constructed gun. As the fibrous flakes leave the gun, they are coated with a spray of atomized adhesive agent and projected onto the surface to be insulated. The coated fibrous flakes form a thick, permanent blanket of insulation covering all cracks and crevices. Sprayo-Flake Insulation can be applied to practically any surface in any desired thickness.

The heat resistance of this unique new insulation has been proved by exhaustive heat transfer tests. These tests show heat transmission through the insulation itself, and also through standard walls insulated with Sprayo-Flake.

Ask for the results of these tests. See this amazing demonstration. Your questions will be answered in detail by the engineers in charge of the Sprayo-Flake exhibit.

SPRAYO-FLAKE COMPANY
Administrative Offices: 56 South Bay Street Milwaukee, Wis.
Sprayo-Flake Corporation of New York, 101 Park Avenue, New York City

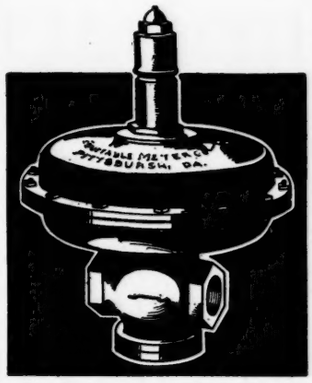
RESISTS COLD — STOPS HEAT
SPRAYO-FLAKE
DEADENS SOUND
Reg. U. S. Pat. Off.

THE GAS FIRED ERA IS IN VOGUE

BOILERS
FURNACES
REFRIGERATORS
INCINERATORS
WATER HEATERS
CLOTHES DRYERS

Refrigerators, water heaters, clothes dryers, incinerators, furnaces, boilers — in fact, all gas fired appliances operate efficiently only when the proper pressure is at the burners.

EMCO Gas Appliance Regulators control the pressure and hold it constant at the burners.



Pittsburgh Equitable Meter Co.
Main Office & Factories—Pittsburgh, Pa

BRANCH OFFICES

Kansas City, Mo. Tulsa, Okla. Seattle, Wash.
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The Watch Dog

For Automatic Heating Jobs!

The NEW Kelly Safety Boiler Control is as efficient as it is simple,—as simple as it is positive.

The NEW Kelly Safety Boiler Control automatically cuts out the heat generating element when the water level approaches the danger line.

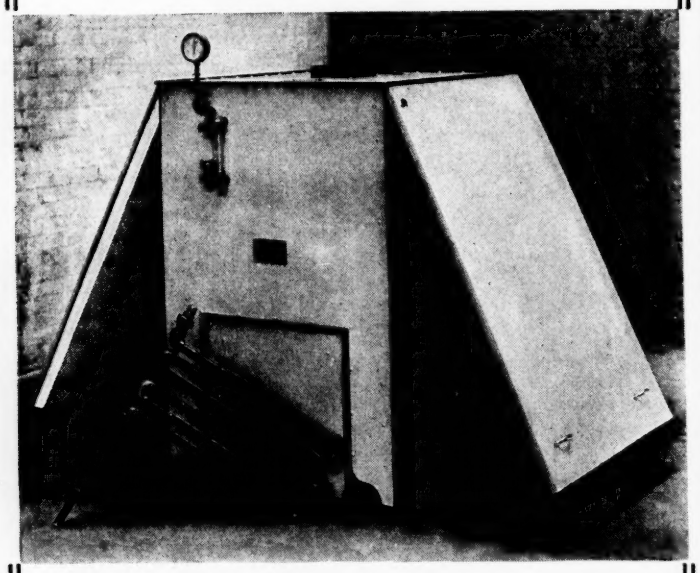
The NEW Kelly Safety Boiler Control is no larger than a fountain pen, but its scientific construction assures uniform dependability.

Be Sure to See It; Booths 249-250, International Heating and Ventilating Exposition, January 27-31, 1930, Philadelphia.

AMERICAN
SAFETY BOILER CONTROL CO.
INCORPORATED
PORT CHESTER, N. Y.

FIVE

POUNDS OF LIVE STEAM GENERATED IN JUST



EIGHT

MINUTES WITH THE

AUSTIN RAPID HEAT GENERATOR

In the unprecedented success of the Austin Rapid Heat Generators used for oil, gas and coal, there are many other factors,—low fuel consumption, accessibility, low maintenance, safety, reliability, convenience, many outstanding original improvements which you should become acquainted with.

Write for Details.

See It; Booths 249-250, International Heating and Ventilating Exposition, January 27-31, 1930, Philadelphia.

Austin Heat Transference Corp.

PORT CHESTER, N. Y.

We Are Here

KNOWLTON WATERTUBE STEEL BOILERS

Space No. 355

Lower Prices to You and Lowest Operating-Maintenance Costs are Interesting to Your Customer

ORR & SEMBOWER, Inc.

COMMERCIAL MUSEUM
PHILADELPHIA, PA.
January 27-31, inclusive, 1930
SPACE No. 355

FOR THE FIRST TIME
an exhibition of the

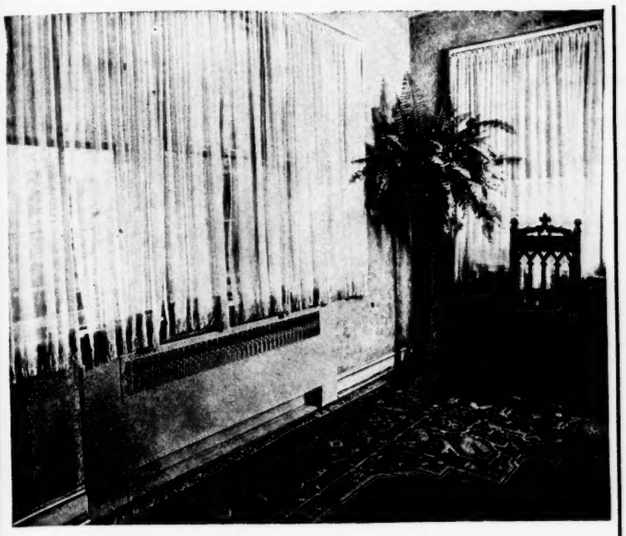
HERCO AUTOMATIC OIL BURNER

at the

INTERNATIONAL
HEATING & VENTILATING
EXPOSITION
BOOTH 245
COMMERCIAL MUSEUM BUILDING
PHILADELPHIA JANUARY 27-31

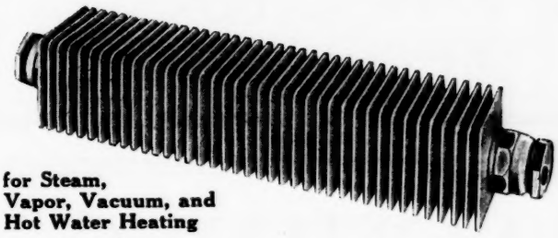
Outside ignition and low pressure operation and the many other special features of the HERCO AUTOMATIC OIL BURNER merit your investigation. For excellent territorial rights communicate with us at the Exposition or write for advance information to

HERR AND COMPANY
OIL BURNER DEPARTMENT
LANCASTER PENNSYLVANIA



FINTUBE

"The Modern Heating Unit"



for Steam, Vapor, Vacuum, and Hot Water Heating

Seamless hard drawn copper tubing. Copper fins are an integral part of the tube. No welding, soldering, or tinning in any part of FINTUBE.

Leak-proof and rust-proof. Will last a life time. Easily cleaned with vacuum cleaner.

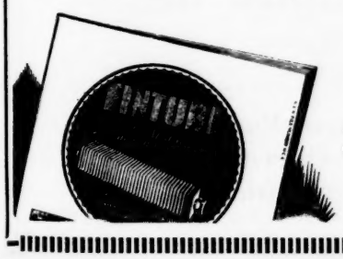
Completely concealed within the walls.

Handsome enclosures can be finished to harmonize with the decorative features of the room.

There is a FINTUBE for every heating requirement.

FINTUBE RADIATOR COMPANY, Inc.

Office and Factory:
44-02 to 20—11th St., Long Island City, N. Y.



A copy of our latest catalog will be mailed upon request

G&O FINNED TUBING

Quality Service

All Types of Finned Tubing For Copper Radiation

FOR many years we have been engaged in producing the finest quality of finned tubing for copper radiation. Our factory and organization are splendidly equipped for the purpose. G & O workmanship is as dependable as G & O material. We shall be pleased to submit estimates and samples to those interested.

G & O RADIATORS

For Automotive Vehicles and Aircraft

For 15 years G&O Radiators for automotive vehicles and aircraft have been notable for their efficiency and are used by the United States Government and leading manufacturers.

THE G & O MANUFACTURING CO.

NEW HAVEN, CONN.

Established 1915

Manufacturers of the famous "G & O" Radiators for automotive vehicles

SAVES 20 PERCENT OF ANY FUEL

COAL

COKE

OIL

GAS

Draft-A-Justor is the brain of the heating plant. Put one on every one of your installations and be sure of satisfied customers. They will appreciate the fuel saving Draft-A-Justor will make for them.

Draft-A-Justor provides a constant, uniform draft in any furnace with any fuel. It keeps the heat in the heating plant by preventing heat loss up the chimney. It eliminates all excess draft.

Draft-A-Justor is made in a full range of sizes from 4 to 20-inch diameters. Your customers will buy it on sight. You can make a big profit selling it.

This is the Draft-A-Justor, Listed as Standard by Underwriters' Laboratories

Send for a free copy of the "Draft-A-Justor Manual." Ask about our generous dealer proposition.

BOOTH 546

More than 79,000 successful installations.

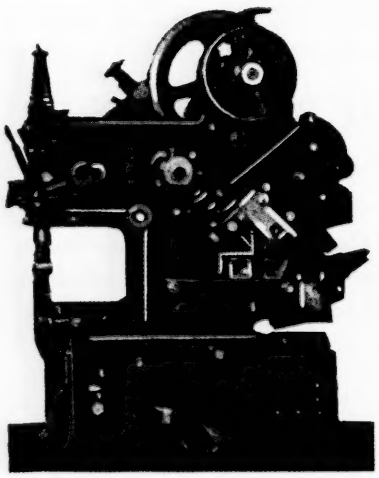
THE DRAFT-A-JUSTOR CORPORATION

228 N. LaSalle St., CHICAGO

SEE OUR MACHINES

at the Exposition, Booth No. 420

SMITH



**Notches and copes.
Shears plates and flats.
Punches wide flange sections.
Shears and mitres angles and tees.
Shears rounds and squares.
With interchangeable knives, shears, beams and channels.**

Unbreakable Steel Plate Frame

Punching and Shearing Machines

. . . . cut costs, boost profits

also

Bending Machines for Rolling Angles, Beams, Channels, etc.

. . . . famous for accurate work

David H. Smith & Sons, Inc.

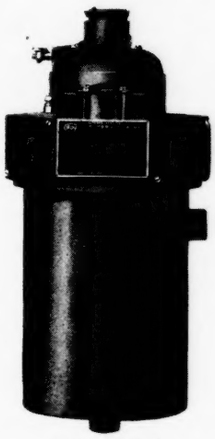
BROOKLYN, N. Y.

Distributors in all principal cities of U. S. A. and Canada

We will show Our Line of Machines at Booth No. 420 during January 27 to 31, at the International Heating and Ventilating Exposition

COOK

Automatic Rotary Fuel Oil Pump "R"



List $75.00

A dependable automatic fuel oil pump with a Westinghouse, Split Phase Motor, directly connected to a Viking Rotary Pump Submerged Under Oil. The pump unit contains no packing.

This pump has an Improved Switch, with the New Mercoid Tube. The switch is mounted on top of the tank.

Strainer is of Monel, easily removed and cleaned. The pump tank is of large capacity.

Delivery 30 gallons of 28° Baume Gravity Oil per Hour at 10 feet. Quiet in Operation.

Simple installation.

List price, $75.00 F.O.B., Chicago.

COOK FUEL OIL GAUGE

List $15.00

Cook Fuel Oil Gauge is a distant reading, high grade instrument, that accurately measures the amount of oil in a storage tank 36″ to 96″ deep.

This Gauge is operated by pressure of air in the tube to which it is connected, caused by the weight of oil in the tank. The Gauge instrument contains a bellows, sensitive to air pressure, and accurately adjusted to operate the gauge needle.

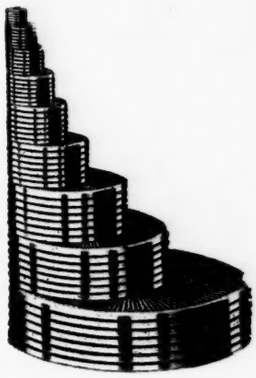
COOK ANTI-SYPHON VALVE

List $13.00

The Type "A" Anti-Syphon Valve is manufactured for ½″ and 1″ suction lines. It is neat in appearance, easy to install, reasonable in price, and listed as Standard by the Underwriters' Laboratories for 18 Baume oil or lighter.

Metal Bellows

of Phosphor Bronze and Monel Metal



For

Air
Gas
Steam
Water
Oil
Acids

The rolled bellows were developed to reduce the number of soldered joints to two. They are limited in their use, however, as they are necessarily made of soft material.

It is a well known fact that a "dead" spring has a short life. Temper bears the same relation to long life in a metal bellows as it does in any spring.

Cook Bellows are made from flat rolled sheet of comparatively hard temper. Care is taken not to impair the temper in the process of forming the flanges or making the joints. The result is a bellows of great durability.

Cook Bellows are made with a joint of unique and new design, and are produced by a new process. Years of hard service have proved the soldered joint to be the strongest point.

Cook Bellows are made in a number of sizes and to any length.

The Cook process insures a uniformly high grade product at a comparatively low cost. Prices necessarily depend upon specifications and quantity.

Our Engineers will be glad to discuss the adaptability of the Cook Bellows to your particular device.

COOK ELECTRIC CO., 2700 Southport Avenue, Chicago

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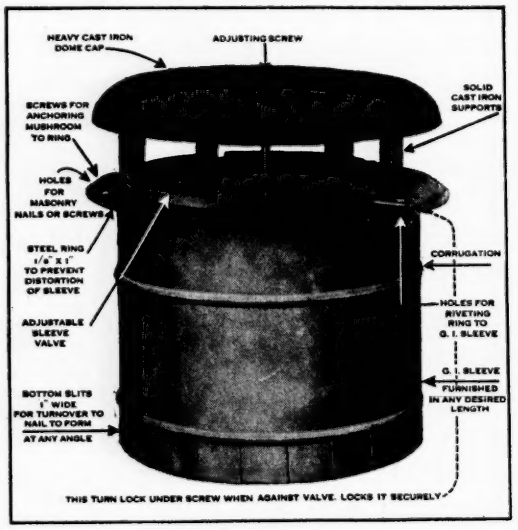
AERO VALVE

Rigid locking device prevents rattling. Absolutely fool-proof. Simply turn lock against the valve and it is firmly locked in any position desired. The ONLY mushroom made, the parts of which cannot be separated either before or after installation.

STRONG SILENT EFFICIENT

MUSHROOM AIR DIFFUSER

WITH HEAVY CAST IRON DOME AND SUPPORTS. ALSO MADE IN HEAVY STEEL.
Simple Adjustment From Top of Cap.


HEAVY CAST IRON DOME CAP
ADJUSTING SCREW
SOLID CAST IRON SUPPORTS
SCREWS FOR ANCHORING MUSHROOM TO RING
HOLES FOR MASONRY NAILS OR SCREWS
STEEL RING 1/4" x 1" TO PREVENT DISTORTION OF SLEEVE
CORRUGATION
ADJUSTABLE SLEEVE VALVE
HOLES FOR RIVETING RING TO G. I. SLEEVE
G. I. SLEEVE FURNISHED IN ANY DESIRED LENGTH
BOTTOM SLITS 1" WIDE FOR TURNOVER TO NAIL TO FORM AT ANY ANGLE
THIS TURN LOCK UNDER SCREW WHEN AGAINST VALVE. LOCKS IT SECURELY

Made only by

Knowles Mushroom Ventilator Co.

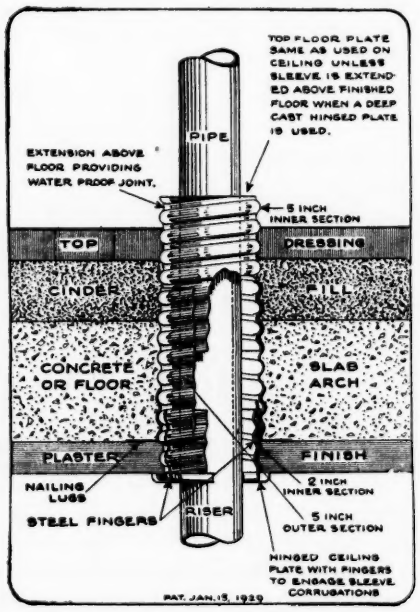
Originators of the Mushroom and makers of the "Nu-Notch" Mushroom and "Disc-Loc" Gallery Riser Vents.

See booklet for detail and specification forms

202 Franklin St., NEW YORK CITY

You Adjust It as the Job Progresses

Extensible PIPE SLEEVE



Saves Labor
Saves Time

Cleaner
Stronger

SUPER SLEEVE

Pat. Jan. 15, 1929

Adjustable for each stage of construction.

Does away with clipping, after-patching and messy work.

The only standard galvanized pipe sleeve of its kind.

SUITABLE FOR ALL TYPES OF BUILDINGS AND SIZES OF PIPES. ALSO RADIATOR CONNECTIONS

For complete detail and specification forms, send for Booklet

Knowles Pipe Sleeve Company

202 Franklin Street NEW YORK CITY

CELOTEX AT THE EXPOSITION

CELOTEX welcomes you to the Exposition. J. H. Bracken, and R. B. Simpson, members A.S.H.&V.E., of The Celotex Company will be found waiting to welcome you, in Booths 451 and 452. Here you can find out all about Celotex—see motion pictures of its manufacture, and learn how it is being used throughout the world to save heat, prevent ceiling condensation and to improve ventilation.

From a production of only 18 million square feet in 1922 Celotex has grown to its present capacity of 480 million square feet annually. Today more than 300,000 homes, commercial and industrial buildings are protected against extreme temperature changes the year 'round with Celotex.

In order to give Heating and Ventilating Engineers prompt and efficient service The Celotex Company has arranged to have representatives here at the Exposition and maintains branch sales offices throughout the entire United States and Canada.

CELOTEX
BRAND
INSULATING CANE BOARD

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919 North Michigan Ave., Chicago, Ill.

Mills: New Orleans, La.

Branch Sales Offices

Atlanta Boston Cleveland Dallas Detroit Denver Kansas City
Los Angeles Minneapolis New York Philadelphia St. Louis Seattle
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Heating and Ventilating EXPOSITION

JAS. P. MARSH & CO.

Division General Instrument Corporation
2073 Southport Ave., Chicago
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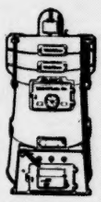
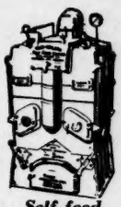
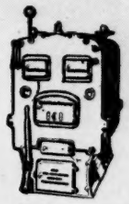
See our exhibit — BOOTHS 560-561

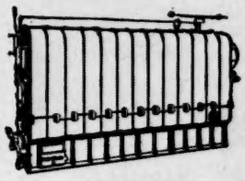
Weil-McLain Boilers fight fuel waste *and deliver more heat*


Round Type Boiler

Jacketed Boiler


Self-feed Boiler


Square Type Boiler


Smokeless Boiler

Cameo Radiator

See the Weil-McLain Display
at the
Heating and Ventilating Exposition
Booth Nos. 347-348-349
PHILADELPHIA
Jan. 27 to 31

Weil-McLain Scientific Combustion Boilers are carefully designed to take advantage of every possible factor that can contribute to fuel economy and utilization of heat. Outstanding structural advantages enable Weil-McLain Boilers to provide more heat and to save fuel. Home owners are quick to understand and appreciate these features.

30% to 40% more heat-absorbing surface

In Weil-McLain Round Boilers, for example, the crown sheet section and all other vital heat-absorbing surfaces are corrugated like this ~~~, instead of flat like this ———. These fuel-saving corrugations crowd perhaps a third more heat-absorbing surface into the same space. Equivalent heating surface is provided in all other types of Weil-McLain Boilers.

Balanced back-and-forth fire travel

More heat is actually utilized in Weil-McLain Boilers because Weil-McLain fire travel is not only back and forth but it is balanced. Variations in the rate at which boilers operate due to varying heat demands do not alter the long, balanced back-and-forth flow of gases through the flues.

There are Weil-McLain Boilers to meet all conditions — Round Type, Jacketed, Square, Self-feed and Smokeless. Also Weil-McLain "Cameo" Radiators.

WEIL-McLAIN COMPANY, General Office, Chicago, Ill.
Boiler Plant and Offices: Michigan City, Ind.
Radiator Plant and Offices: Erie, Pa.

Jobbing distributors with local stocks in most jobbing centers

Weil-McLain
SCIENTIFIC COMBUSTION
BOILERS
fight fuel waste and deliver more heat

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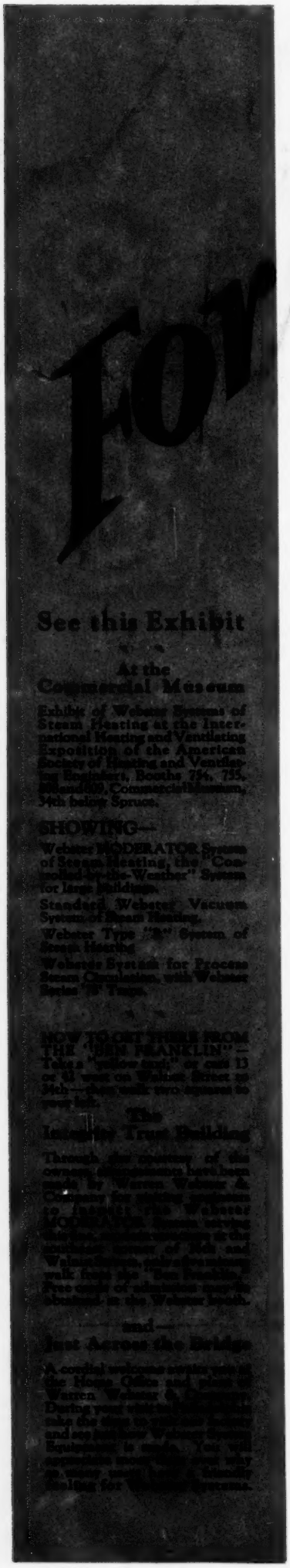
For
See this Exhibit
At the
Commercial Museum
Exhibit of Webster Systems of Steam Heating at the International Heating and Ventilating Exposition of the American Society of Heating and Ventilating Engineers, Booths 734, 735, and 809, Commercial Museum, 34th below Spruce.
SHOWING—
Webster MODERATOR System of Steam Heating, the "Controlled-by-the-Weather" System for large buildings.
Standard Webster Vacuum System of Steam Heating.
Webster Type "A" System of Steam Heating.
Webster System for Process Steam Circulation, with Webster Series "B" Traps.
HOW TO GET THERE FROM THE "BEN FRANKLIN"—
Take a "yellow cab," or cars 13 or 43 west on Walnut Street to 34th—then walk two squares to your left.
The
Insurance Trust Building
Through the courtesy of the owners of this building, arrangements have been made by Warren Webster & Company for special equipment to operate Webster MODERATOR System of Steam Heating in the main entrance of the building, and Webster Vacuum Steam Heating in the remainder of the building and Webster Traps, only a few minutes' walk from the "Ben Franklin." Free copies of admission cards may be obtained at the Webster booth.
—and—
Just Across the Bridge
A cordial welcome awaits you at the Home Office and plant of Warren Webster & Company, Camden, N. J. During your visit to Philadelphia make the time to visit this plant and see how Webster Steam Heating Equipment is made. You will appreciate more than ever why Webster users have made Webster Systems for Steam Heating the standard of quality.

For every need!

For more than forty years Warren Webster & Company, pioneers of the Vacuum System of Steam Heating, have kept well in advance of the growing diversity of demand for heating service, with a Webster System specifically adapted to every individual heating need or problem.

Today this standard—*a Webster System specifically adapted to every heating need or problem*—gains a new significance . . . Now you can select from *four* basic Webster Systems—each built to meet certain conditions; each a combination of service, experience, equipment and engineering methods varied to meet the heating requirements of the individual installation.

Be sure to see the newest developments in Webster Systems during your visit to Philadelphia. See column at left for complete details.

WARREN WEBSTER & COMPANY
Pioneers of the Vacuum System of Steam Heating
CAMDEN, NEW JERSEY

Branches in 52 principal U. S. Cities
In Canada—Darling Bros., Ltd., Montreal

-since 1888
Webster
Systems of
Steam Heating